VOL. XXVIII NEW YORK—THURSDAY, January 23, 1913—CHICAGO No. 4

New York's Truck Show Opens

Sixty Makers of Gasoline Vehicles and Seven of Electrics Attendance Unprecedented—10,000 at Garden Opening Night

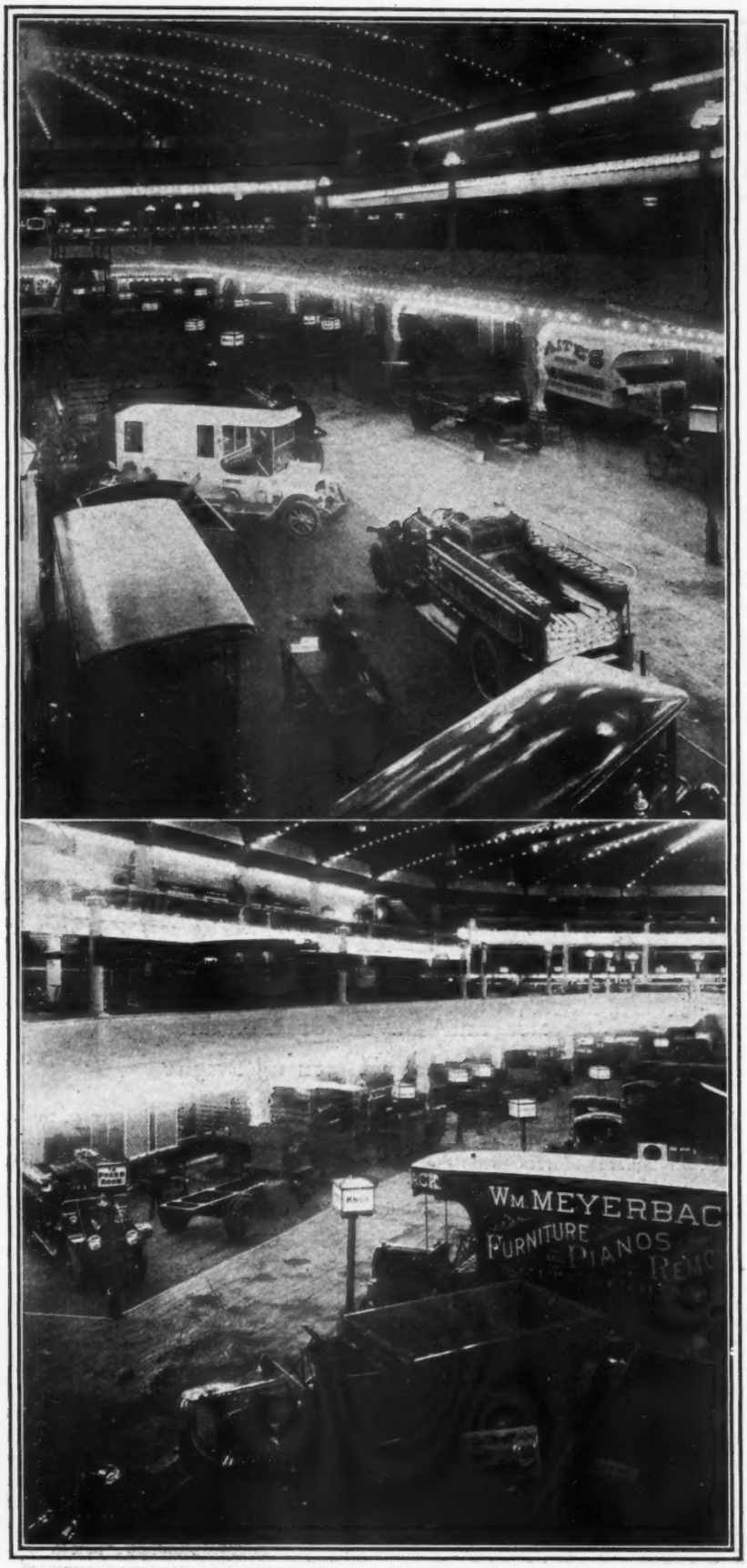
SIXTY makers of gasoline commercial vehicles and seven makers of electric vehicles comprise the truck show which is running simultaneously this week in Madison Square Garden and Grand Central Palace and constituting what history will know as Part Two of the National Automobile Show in New York City for 1913. In addition to these vehicle exhibitors are many accessories for motor trucks and also a machinery exhibit in the Garden basement by members of the National Machine Tool Builders' Association. It is the first time that such a machinery exhibit has been made at an automobile show and the interest that spectators show in the big machines manufacturing automobile parts augurs well for its continuance next season.

Since the inception of the national truck show the public has taken kindly to the exhibition partly because of the mammoth proportions of the huge freight carriers, but also because of the economic part the motor is playing in city and suburban transportation today, and the crowds on opening night gave promise of a greatly increased attendance over that of last year. The show committee has done its part to get the attendance on hand. Invitations have been sent out to all business houses rated above a certain standing within the metropolitan area and every response means a free admission to both shows. The committee can do little more than bring the business men to the Garden or Palace; it is up to the exhibitors and their selling forces to do the rest. Over 10,000 were present at the Garden on opening night.

That the truck industry has made gigantic strides during the last 12 months is apparent on every hand. The vehicles are improved; the methods of selling machines have improved, thanks to the aggression of the National Association of Automobile Manufacturers and the determination of the best makers; the old-line makers have generally increased the number of models so as to cover the entire gamut of industrial transportation; there are over a dozen new faces, and while not a few, who were present a year ago, are missing today, it is not because they have been eliminated from the field, but in some cases due to financial difficulties and in other cases to changes in policy.

The new faces in general represent a class of manufacturers building machines for light-delivery service, ostensibly of the house-to-house delivery variety, the vehicles varying in load capacity from 800 to 1,500 pounds. Some of these new faces seen at the show are Krebs, Brown, Maccar and Koehler, whereas newcomers making larger-capacity models are Hydraulic, Standard, B. A. Gramm and Studebaker.

While the advent of new concerns always adds a glamour of



Two views of New York's Motor Truck Show. Upper—Ground floor of Madison Square Garden, showing the way the trucks are arranged and giving an idea of the exhibits in the gallery. Lower—View down another aisle at the Garden

expectancy to any exhibit there is not any lack of interest with the products of the old concerns because there has been a general adding of models all along the line, and while frequently the new models are largely duplicates of the old ones, there are invariably nice points of interest by way of improved designs or original body conceptions.

Space would scarcely permit to more than suggest a few of the concerns that have added models to fill up the gaps, if the expression may be used, in the lines of last year, so that now the shrewd buyer can without difficulty equip his machines of the same make and having load capacity anywhere between 1,500 pounds and 5 or 7 tons. In this respect the truck program is directly opposite to the trend in passenger car field. A few examples will show the trend:

Packard has added a 5-ton and now has three models, 2, 3.5 and 5 ton.

The International Motors has added a 1,500-pound wagon and its line now embraces 1,500 pounds and 1, 1.5, 2, 3, 4, 5 and 7 Macks; 10-ton Hewitt, and 5 and 6.5-ton Saurer.

Knox has added a 15-20-ton tractor of the Martin-Knox type and its line includes 1.5, 2, 3, 4, 5, 6, 7 and 15-20-ton machines.

The G. M. C. has added three models 3, 3.5 and 5-ton machines to its line of 1.25 and 2-ton trucks and so now thoroughly covers the field up to 5 tons.

Lauth-Juergens has added a 5-ton model and now has 1, 2, 3 and 5-ton machines.

The Garford list of 2, 3, 5 and 6-ton machines has been increased by a 10-ton tractor which in brief is a close-coupled 6-ton truck built to carry the front end of the trailer on a fifth-wheel arrangement.

Mais has added a 3-ton model and now boasts of four models, namely, 1.5, 2, 2.5 and 3 tons capacity.

Pope-Hartford has added to its 3-ton model of last year two others, namely, 1.5 and 5 tons, giving it a wide range of load capacity.

Speedwell has added a 2-ton model to its 4 and 6-ton machines of last season.

Universal has added a worm-driven model of 1-ton capacity and now has 1, 2 and 3-ton models.

The Kissel line has another model of 1.25-ton capacity and gives a line of seven models, namely, .75, 1, 1.25, 2, 3, 4 and 5.

Sternberg has added a 7-ton model to its 1912 line of 2, 3, 4, 5 and 6-ton models.

Space will not permit to enumerate further the general broadening in the models carried; in a word, practically 90 per cent. of the makers have added new models. There are some companies who saw in advance the advantage of a wide range, and have not found it necessary to make additions. In this class are such concerns as White, Peerless, Alco. On the other hand, there are some makers who for the present are confining their efforts to a single model, such as Pierce-Arrow, Locomobile, Lippard-Stewart, Autocar, Stewart, etc.

There are not a few points of interest in the present show besides new faces, new models and new designs. Among these are the new Hydraulic truck, made without clutch or gear-box, but having instead an hydraulic pump and motor system. The gasoline engine drives an oil pump which in turn delivers the oil and drives two hydraulic motors, attached respectively to the right and left rear road wheels.

Also seen for the first time is the French Latil truck with front-wheel drive. It is in the booth of the Walter company, which concern is going to manufacture this type in America. The four-cylinder motor, clutch and gearbox are all nested between the front road wheels. The drive is by short shafts with universal joints through spur pinions into large gears on the road wheels.

Third comes the big 15-20-ton Knox-Martin tractor and also the 10-ton Garford tractor.

Reverting to the new faces at the show and the new models, perhaps the new Studebaker line of gasoline trucks, seen for the first time, is arousing as much interest as any others. This line is most complete, including 1-2, 3-4 and 5-6-ton machines, all designed on the same general lines. The trucks are conventional, using four-cylinder motors under the hood, a gearbox in unit with the motor and shaft drive to a jackshaft, which drives by inclosed spur pinion to large gears on the rear wheels. The motors are governed from the gearbox and not from the crankshaft or other motor shafts.

The Kelly line is entirely changed from last year and now consists of two four-cylinder water-cooled models with Renault type hoods, namely, radiator in rear of the motor. Both have left-hand steering with center control. The 3-ton has T-head cylinders cast in pairs; the 1-ton uses an L-type block casting. Both are shaft-driven models with the gearbox a unit with the rear axle.

The Gramm company has added a 1,500-pound wagon known as the Willys Utility wagon. It is a conventional motor-under-the-hood type using a four-cylinder motor with unit jackshaft and gearbox and with side-chain drive from the jackshaft to the rear wheels.

Reo has added a 1.5-ton four-cylinder model, made up of a motor and gearset of similar design to that used in the passenger car. Chain drive is used.

Buick is out with two new models of 1,000 and 1,500 pounds capacity. The design is a motor-under-the-hood type and uses a four-cylinder block motor, three-speed gearset and shaft drive.

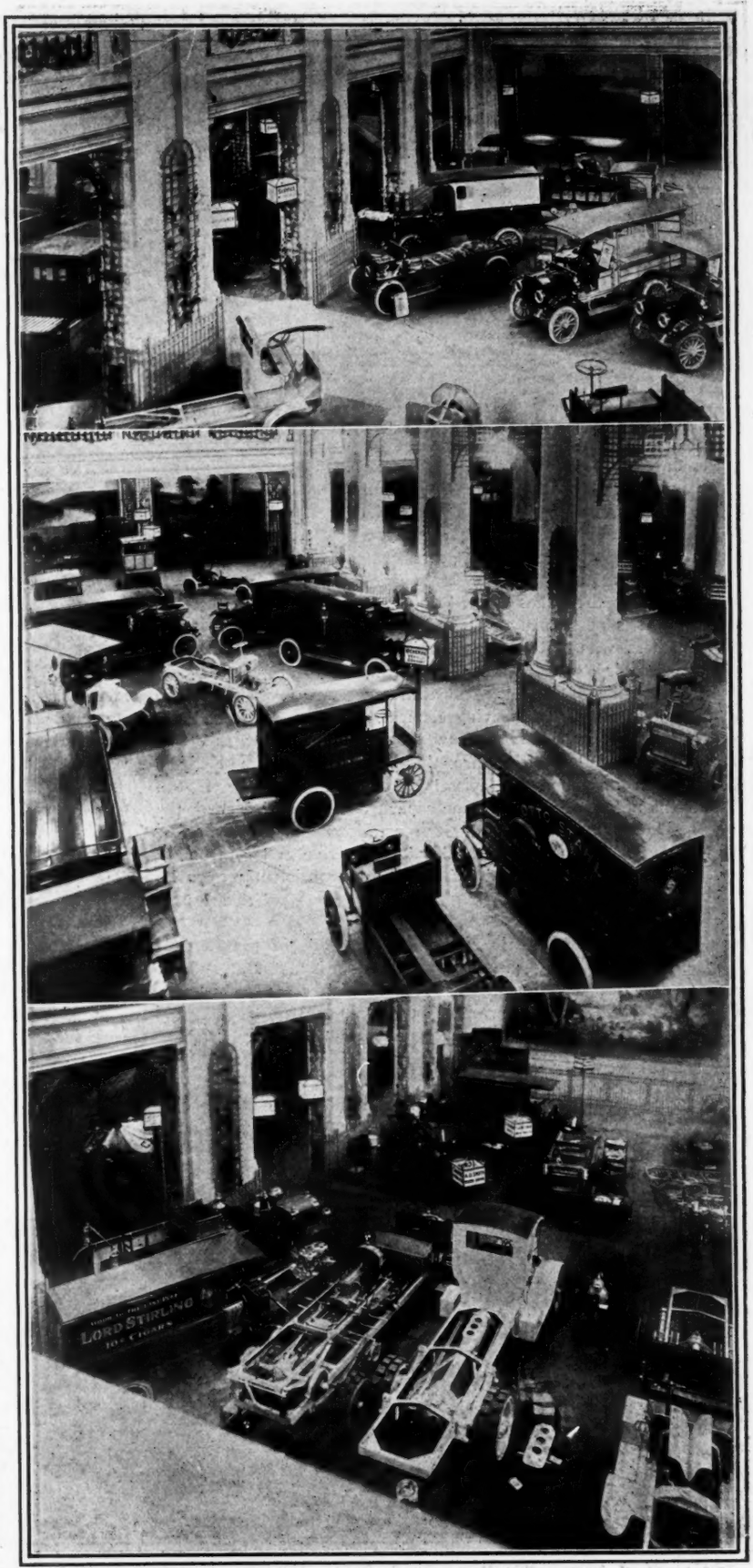
The new Brown delivery wagon of 1,500 pounds capacity has the motor under the hood, uses a block design, uses shaft drive and fits a combination stationary and live rear axle, the drive shafts of which transmit through spur gears to the road wheels.

The Krebs, a new concern, which announced two-cycle models in the early fall, is manufacturing these in 1,500 pounds and 1-ton models and has added a 1.5-ton four-cycle model built on the Renault-hood lines with the block motor accessible in front of the radiator, forms the dash. The motor has four cylinders.

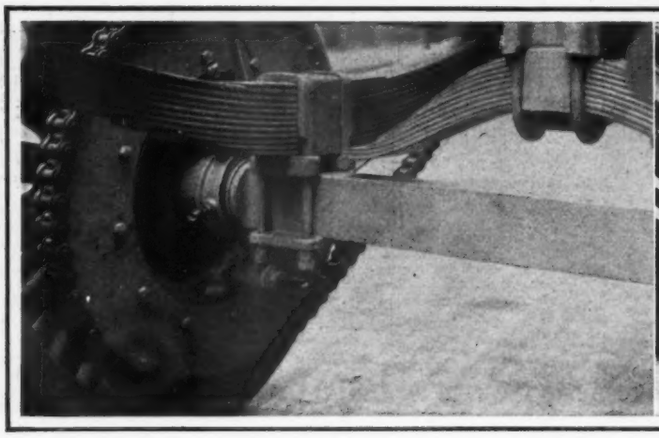
Maccar is one of the newest machines at the Palace and is the design of J. M. Mack, recently of the Mack company. It is a four-cylinder motor-under-the-hood style with gearbox in unit with the motor and shaft drive. There are two sizes, one 1,500 pounds, the other 1 ton.

The Vulcan trucks, seen for the first time at a National show and announced during the past summer, are made in 2, 3, 4, 5, 6 and 7-ton sizes. They place the four-cylinder motor under the hood, use a patented gearset which greatly simplifies gearshifting and employ chain drive.

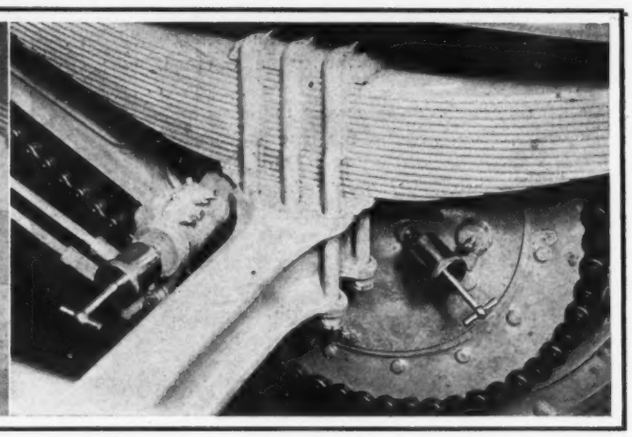
This narration of new faces and new models could be continued much longer, but



Three views of the division of the Motor Truck Show at Grand Central Palace. Top—One-quarter view of the ground floor looking toward aisle. Middle—View across central part of the main floor. Bottom—Cross-view of the back of the hall



Auxiliary spring on KisselKar which comes into play when the truck is heavily loaded



Mounting of rear springs on Kelly, showing accessible grease cups and large chain sprocket

the different types will be treated individually at a later date.

Again taking up the thread of general tendencies as exhibited by the sixty makers of gasoline machines on exhibition, it is possible to trace with fair accuracy not a few certain avenues of development, which it now appears that the truck will follow in the next few years.

Left-hand drive has gained much ground since last year's show. It is noteworthy that on the newer designs brought out by makers who have been in this field for several years or more, have left steer with center control, making for easy access on either side of the car, a small feature but nevertheless one which involves the time-saving element.

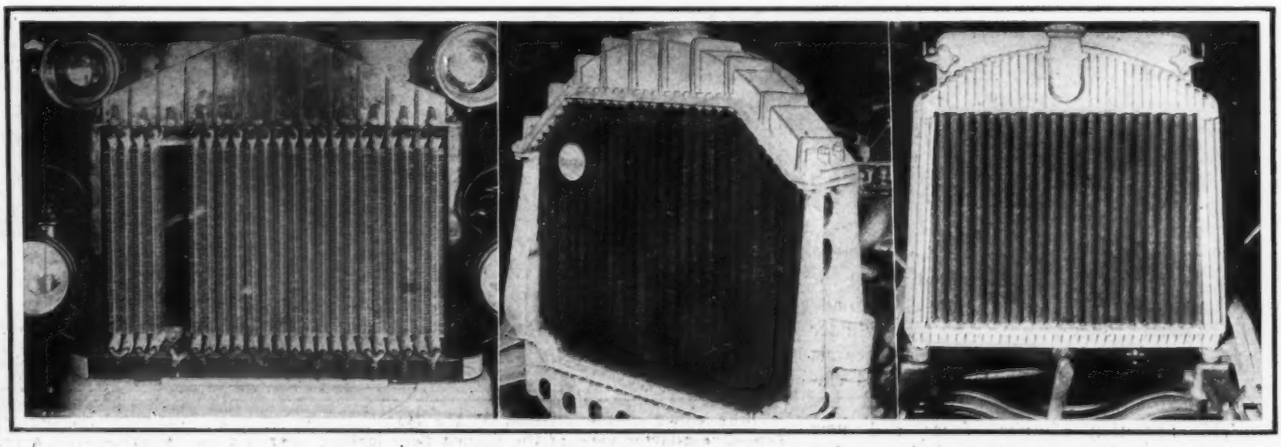
Among the new cars or new models which show this tendency toward left drive are the White 5-ton, the Kelly 1 and 3-ton machines, the Kissel 2,500-pound type, the 1.5-ton Reo, the new Mack of the same capacity, the new Universal, the Pope-Hartford new 1.5 and 5-ton creations and a number of others. On the new 5-ton Packard right drive and control are retained, these commercial vehicles being consistently opposite in driving control from their pleasure car mates, which are now all left drive.

Several machines are in evidence with hoods of the Renault type, radiators being placed at the rear of motors. Among these may be mentioned the Kelly, Walter-Latil, Lippard-Stewart, Krebs and Stewart. Two Universals, though fitted with radiators at the rear of the power plants do not use sloping hoods and should not be properly classed among the Renault types of design.

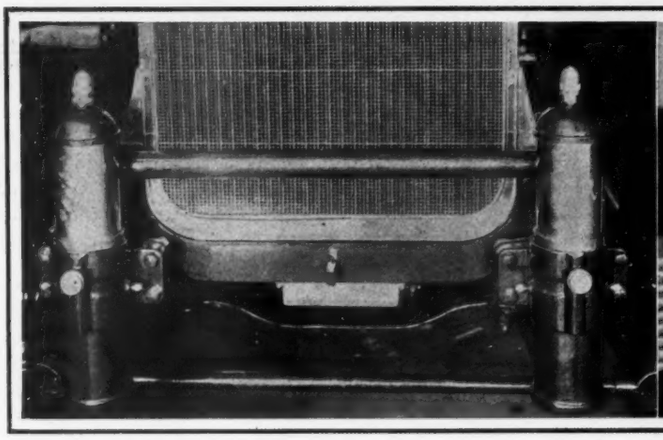
Engine starters have not gained much headway so far as commercial vehicles are concerned, their conspicuous absence on the commercial products being in striking contrast to the almost general use of some sort of cranking device on the pleasure vehicles exhibited last week. There is a general feeling among the truck makers that the starter for commercials must come if public sentiment along this line continues as it has for some time. There are a number of the exhibitors, however, who can see no use whatever for the starting device on the truck, since there is no great consideration of comfort to dictate the practice. "If the truck driver is to be set on a pedestal and humored to such an extent that he can sit back in his leather-cushioned seat and never have to crank his motor, he is too good to be a truck driver," said one exhibitor. Others advanced the argument that the increased cost to the truck buyer of putting on a starter does not pay in amount of fuel saved by shutting off the motor at each stop for the interest on the increased money invested. There are still others who do not believe there is any saving at all in stopping the gasoline motor every time a short stop is made as in package delivery service. The amount of fuel needed for starting is greater than would be that used were the engine throttled to low speed and left to run at these stops. The Krebs and the Schacht are the makes conspicuous for the use of starting devices this year.

The relative positions of the various methods of power transmission to the rear wheels remains about the same as last year. There are eleven makes which have shaft drive, that is, Studebaker, Mais, Buick, Lippard-Stewart, Brown, Maccar, Rowe (optional), Hupmobile, Autocar and smaller White models. Save for the five makes which have worm drive the remainder of the fifty-nine have jackshaft and side chains. In most instances the shaft driving through bevel gears is confined to cars of lighter capacity, the larger trucks quite generally adhering to the jackshaft construction, as heretofore.

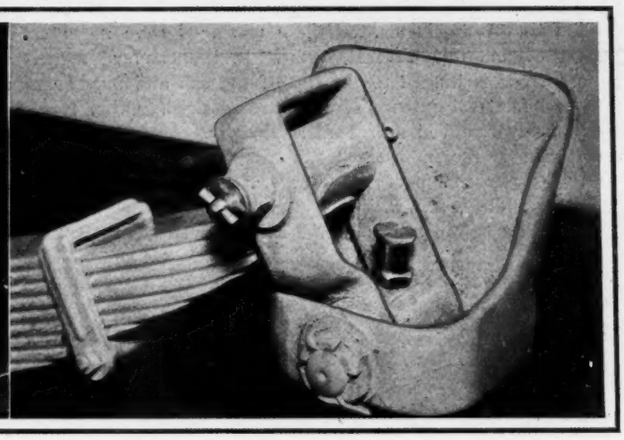
Worm drive holds its own. The Pierce models, which are exclusively 5-ton designs, have practically the same worm-drive



Three types of demountable radiator construction for truck work. Left to right—Reo, Kissel and Universal



Showing the Westinghouse shock-absorber at the front of one of the Walter models



Kelly substantial spring shackle which is provided with grease cups at both bearing points

constructional details as formerly. The new Universal 1-ton appears as a worm-driven type; four of the Blair models are so designed; two A. O. Smiths continue to carry their characteristic features; the Rowe models may be optionally supplied with worm propulsion. Most of these worms are of the overhead type, which, though open to the criticism that their oiling is somewhat less effective than that of the underneath worm design, nevertheless reduce the driveshaft angle and increase the road clearance. Schacht and Krebs are worm-driven types.

Chain covers are still somewhat in vogue, although not favored by a number of makers. The Knox and the Locomobile are examples of clean, substantial and easily removable types.

Several designs of sectional radiators have appeared. Among these are the new Reo, Kissel, the Vulcan and the Universal. The latter two employ types with separate tops, and while this is also true of the Reo, it makes use of separate tubes as well. These sections are mounted vertically, one crow's-foot clamps holding each two tubes at top and bottom.

It is a noticeable fact that the majority of the makers are equipping their cars with sealed governors, which are regulated to maximum speeds dependent upon the truck capacity as recommended by the N. A. A. M. It has been found that most makers favor these recommendations. The N. A. A. M. standard warranty plate is also much in evidence. This relates to load capacity, body weight and speed.

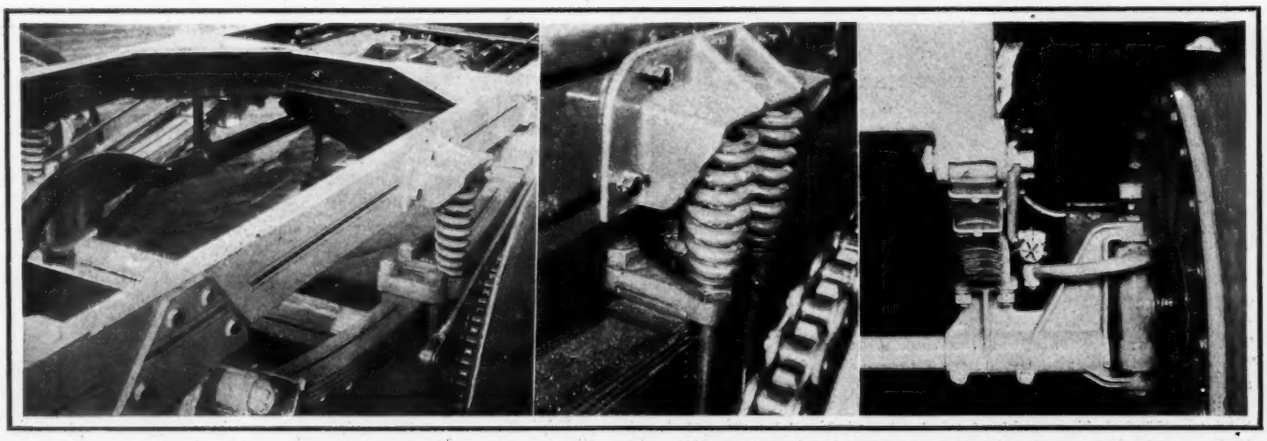
The National Association's recommendation that the mechanism of the truck be so arranged as not to come above the level of the frame members also appears to have been fruitful, for several makers who last year had brake rods, equalizer rods, cross pieces and grease cups above the frame level, have put them below. The object of this is so that any type of body may be accommodated.

Supplementary springs are much more prominent for larger sizes of trucks than they were last year. These take several forms, the predominating designs being either cross types, which come into play only when the frame is considerably compressed, or coiled varieties fastened on the rear axle. A number of cars are fitted with rubber bumpers, which are also attached to the axles.

Steel wheels do not appear to be making much headway, only a few makes exhibiting machines so equipped. This seems rather unaccountable inasmuch as the steel wheel is somewhat lighter than the wood type of the same carrying capacity. There seems to be a general impression, however, that the metal wheel tends to greater vibration and has less shock absorbing qualities. The Locomobile trucks appear with steel wheels, as do the A. O. Smith and the Grand Rapids makes. White is exhibiting several models so equipped as well as those with wood wheels.

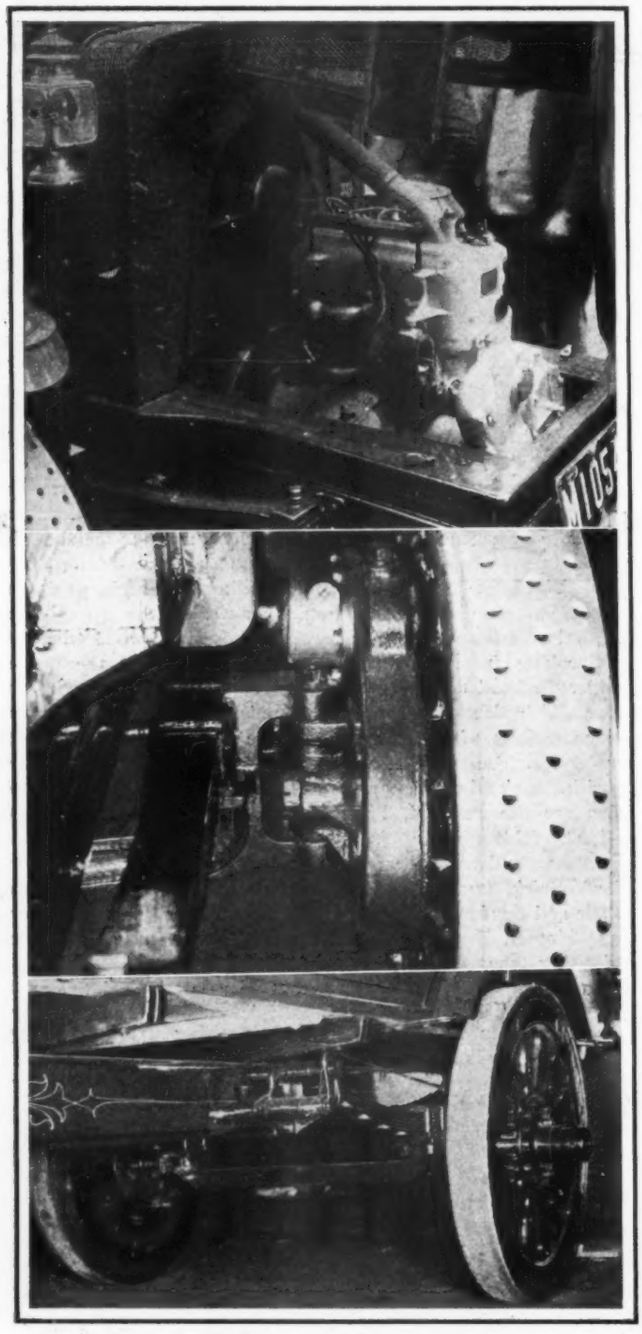
Speaking from the standpoint of cars on view the motor-under-the-hood type of design is favored as compared with the type which places the power plant under the seat. Four makers show designs of both varieties, while there are eleven of the under-seat construction and twenty-seven having the drivers position back of the motor. Notable adherents to the latter position are the Packard, Pierce-Arrow, Peerless, White, Saurer, Kissel, Selden, Velie, Atterbury, Studebaker, Smith, Service, Stegeman and a number of others. Garford, Alco, Pope-Hartford, Buick, Locomobile, Speedwell, Lauth-Juergens, Steinberg, Blair and Sanford makes use the motor under-seat design. General Motors, Knox, Mack and Universal will furnish machines of either type.

Protection for the driver has not been overlooked this year. Many cars are equipped with well-designed cabs, some completely inclosed, some with stationary tops and others with fold-



Two views of Lauth-Juergens auxiliary conically wound springs. Reo front axle, showing integral yoke and spring seat

ing tops. Windshields for these machines have not been lost sight of and take several forms. In the Garford models the glass front is hinged to the top of the cab and may be swung up and fastened out of the way when desired. Other types may be quickly removed or folded sectionally. A good arrangement for seats is shown in the Knox cab, there being a partition or arm between that portion of the seat allotted to the driver and the remainder of it which is intended for his helpers. Such a seat makes it impossible for the driver's quarters to be crowded by other occupants of the seat, and is a safety feature in that it gives the driver plenty of room for manipulation of his pedals and levers.



The Latil motor mounted in the front drive car of this name which is exhibited by the Walter Company. The design is to be manufactured by Walter under royalty. It is a French product. The radiator is mounted at the rear with the fan at its center. The center view shows the housing for the driving gears, and the shaft connection from the differential under the motor. The wheel gear bolts to the front wheel. Gears are of the spur type. Lower view—Clean-cut appearance of the underneath part of the Latil truck. Note the use of steel-tired wheels at the rear. This is a foreign tendency

Dumping bodies are also very much in evidence, a number of the foremost makers exhibiting them. These appear either as power-operated types or for hand manipulation. Noticeable among the power-operated type are the Packard, Alco, Locomobile, G. M. C., Mack, White, Pierce and Peerless, while Speedwell, Kissel, Universal, Garford and Knox favor the hand-operated body judging from their exhibits.

The A. O. Smith Company has discontinued its 3-ton chassis brought out last spring and now builds 3.5 and 6-ton models, both identical in design with their predecessor and characterized by worm-driven rear axle and a gearbox in which herringbone gears take the place of spur types and in which individual clutches are used for speed changes. The entire set of gears attaches to the cover of the gearbox, giving a readily-removable arrangement. This is one of the few companies to use steel wheels, other concerns using them being White and Locomobile. The company offers an option in wheelbases, a practise followed by a majority of the truck makers, due to the bulk of different commodities. Coal and sand call for a much shorter wheelbase than furniture. The standard wheelbase on the 3.5-ton model is 168 inches and the options are 144 and 190 inches. On the 6-ton vehicle the same measurements are used.

The question of most satisfactory wheelbases is a difficult one to solve and so not a few makers give a standard and announce maximum and minimum measurements and give any desired lengths between these extremes. In truck designs like the White, new Studebaker, etc., the different capacity bodies can be accommodated by cutting off the overhang of the frame side members. In other trucks the alteration calls for longer side members. Lauth-Juergens, on its four models, gives a standard length on each with options of 10 inches under or over this standard. For its 1, 2, 3 and 5-ton trucks the standard wheelbases measure 110, 120, 120 and 140 inches respectively.

On the 3-4 and 5-6-ton Studebakers the standard wheelbase measurement is 144 inches. The Durable-Dayton gives wheelbase options ranging from 16 to 20 inches above standard. On light delivery wagons, such as the Stewart and others in its class, it is customary not to give any wheelbase option, as the body fitted has generally capacity adequate for the different industries in which it may operate.

The majority of manufacturers have been giving careful attention to the distribution of useful load weight over rear and front wheels. These ratios vary considerably depending on whether the truck is a motor-under-the-hood type or one of the motor-under-seat type. In the motor-under-the-hood design generally 75 or 80 per cent. of the useful load is supported by the rear wheels and from 20 to 25 per cent. over the front wheels. On the other hand, where the motor is mounted under the seats, or between the seats, there is not so much overhang and the load distribution varies to 35 per cent. on front and 65 per cent. in rear. Makers are now fitting tires and springs to meet the conditions that the truck design imposes.

Makers are more conservative than ever before in the speed rating of their different machines and gear ratios between the motor and rear wheels are not only suited to the demands of the industry in which the truck operates, but also to the topography of the city or country in which it works. One maker listing four truck models gives different speds for different cities as follows and then again varies these in each city according to the nature of the work:

Truck capacity	Chicago M.P.H.	Cincinnati M.P.H.	Pittsburgh M.P.H.
1.5 tons	15	14	12
2.5 tons	14	13	11
3.5 tons	13	12	10
5 tons	12	11	8

When the entire truck industry is taken into consideration it is seen that the makers are yet far from having agreed upon any definite speed for different capacities. This is largely due to differences in design.

High Cost of Fuel Arouses Consumers

Concerted Action Contemplated in Manhattan To Cope With the Present Soaring Price of Gasoline

Statement Issued by Oil Refiners Defending Demands—New York Garage Association to Act

NEW YORK automobilists and garage owners are up in arms over the threatened increase in price of gasoline. It is probable that a campaign against the rise will be instituted when the New York Garage Association holds its annual dinner on January 28. At this dinner the proprietors of the large garages of the country will be present and ways and means for coping with the situation will be discussed. Many private citizens have signified their intention to co-operate with the garage men in the movement.

The present price of fuel in this city, Boston and other large centers is 22 cents a gallon retail for quantities less than 5 gallons, and 20 cents a gallon in amounts between 5 and 25 gallons. For quantities above 25 gallons, the wholesale figure of 17 cents prevails. This brings the price which the garage man asks somewhere in the neighborhood of 25 cents a gallon.

In a statement issued yesterday by Collins, Armstrong & Co. based on data compiled by Texas Company, the price of gasoline is discussed as follows:

"The advance in price of gasoline has brought up a great many times the question as to the reasons for it and the future supply. This question is being continually asked by motor owners, garage men, manufacturers and others interested in the motor business. It is, consequently, advisable that all salesmen should study the following items which show the conditions which pertain at the present times in respect to the motor fuel business.

"The total production of crude oil in the year 1911 was 220,000,000 barrels.

"The total production in the year 1912, as far as this can be gathered from reports at the present, will be somewhat less.

"The total production for the year 1910 was approximately 200,000,000 barrels.

"Only a certain proportion of this supply produces any commercial quantity of gasoline. The gasoline producing crudes in 1910 figured 126,000,000 barrels; in 1911, 127,000,000, and in 1912, 124,000,000 approximately.

"In 1910 there were 300,000 cars in service; in 1911, 550,000; in 1912 nearly 900,000, and it is expected that 1913 will bring this up to 1,400,000.

"In addition to the cars, there were in service in 1912 35,000 motor trucks, 75,000 motor cycles and 100,000 motor boats.

"These figures do not include the enormous number of stationary gasoline engines of small size for farm and country use which have been put in the market in the last two or three years.

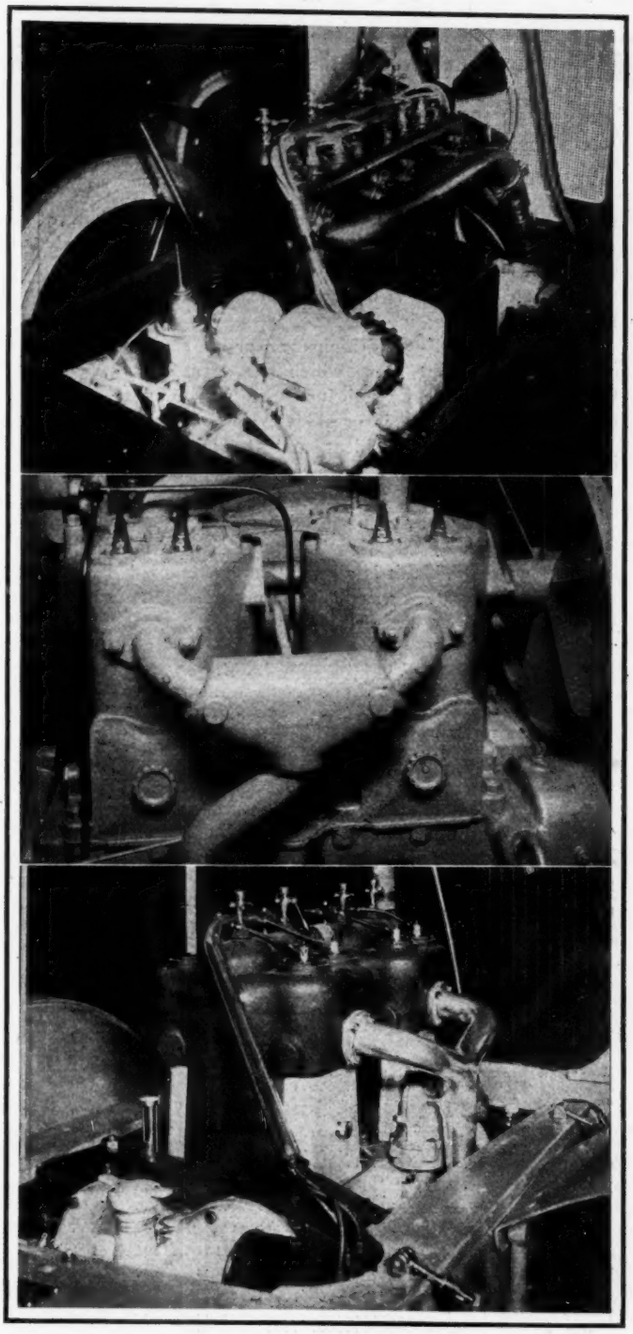
"In other words, the supply of gasoline is fixed or slightly declining, while the demand for the same is increasing with great rapidity. As a consequence of this, gasoline is increasing in value. Even at the increased price, however, the cost of gasoline is only a very small part of the cost of operating a car.

"Suppose a car runs 5,000 miles in the year and uses 500 gallons of gasoline, an increase of 5 cents per gallon would only mean $25 for the year. A small increase in the price of the tire or some of the other items which enter into the running of a car would mount up to a very much larger sum in the total operation of the year.

"Further, it might be advisable to note that the price of rubber, on account of the extensive use in the motor industry, has advanced enormously in the last few years, and there is no reason for the advance of rubber which does not apply to the advance of gasoline.

"In the production of gasoline for the market, it is necessary to drill deep wells with the certainty that at least seven out of ten of the wells which are drilled will yield nothing and be a dead loss.

"Then it must be pumped out of the well, gathered into expensive tankage, shipped through hundreds of miles of pipe lines, with expensive pumping stations every fifty or sixty miles; put through the refinery, distilled, cleaned, deodorized; shipped by tank car, tank steamer, etc., to distributing terminals, where again it must be stored in expensive tankage, rehandled, put in drums for wagon delivery or reshipped to smaller distributing stations; again tanked, rehandled and delivered by tank wagon—and for all these operations we cannot secure but a few cents a gallon more than the man does for the water, without a great deal of grumbling on the part of the consumer."



Top—View of the motor and electrical equipment of one of the new Krebs trucks. Middle—The Studebaker engine design. This motor is water cooled and the cylinders are compactly cast in pairs. Note the peculiar manifold construction. The valve springs and rods are inclosed by the easily removable covered plates provided with hand screws. Bottom—Power plant of the Kelly commercial car, showing the T-head motor construction with inclosed valves. The rear support of the motor is arched and the crankcase is slung beneath it. The wiring is carried in a tube which passes along the top of the cylinders to the back of the motor as shown

Columbus Buggy Receiver

Daniel McLarin Named—Valentine & Co. Allege Assets of $1,000,000 and Liabilities Approximating $600,000

Has Preferred Stock to the Amount of $1,300,000 and Common Stock to the Amount of $300,000

COLUMBUS, O., Jan. 20—Upon application of Valentine & Company, dealers in oils and varnishes, New York, Daniel McLarin was named receiver for the Columbus Buggy Company, of Columbus, by Judge Slater in the United States Court January 18. Mr. McLarin took charge of the large plant of the concern, located on Dublin avenue, almost immediately and announced that no let-up in operations would take place. In the petition Valentine & Company allege assets of $1,100,000 and liabilities approximating $600,000.

The Columbus Buggy Company was a reorganization of a concern of the same name which has operated a carriage factory in the Buckeye Capital for more than a quarter of a century. C. D. Firestone is president; C. E. Firestone, secretary; J. F. Firestone, vice-president, and O. H. Perry, treasurer. It has preferred stock to the amount of $1,300,000 and common stock to the amount of $300,000.

It is alleged that many of the debts of the company are overdue and threats of litigation have seriously impaired the credit of the concern. This, it is alleged, has endangered the creditors' claims and a receiver was believed necessary. It is stated that vehicles, both horse-drawn and automobiles, to the number of 100 are being built and contracted for which will amount to about $1,250,000. Stockholders are expecting a reorganization.

Automobile Securities Quotations

The week brought few developments in the automobile stocks traded at the Exchange. The most noteworthy change was the advance made by Consolidated Rubber, both common and preferred rising 5 points. Miller, Goodyear and Rubber Goods Manufacturing were likewise strong. Alco and Lozier closed slightly below last week's figures.

	1912 Bid	1912 Asked	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co., com	..	..	180	200
Ajax-Grieb Rubber Co., pfd	..	..	95	101
Aluminum Castings Co., pfd	..	..	98	101
American Locomotive Co., com	34	35	38¼	39
American Locomotive Co., pfd	103	103½	103	105
Chalmers Motor Company	..	..	130	145
Consolidated Rubber Tire Co., com	5	12	19	21
Consolidated Rubber Tire Co. Co., pfd	10	25	70	75
Firestone Tire & Rubber Co., com	178	185	334	338
Firestone Tire & Rubber Co., pfd	108	110	105	107
Garford Company, preferred	..	..	100	102
General Motors Company, com	34½	35½	33	34
General Motors Company, pfd	74½	75½	76	78
B. F. Goodrich Company, com	..	..	62½	63½
B. F. Goodrich Company, pfd	..	..	104	105
Goodyear Tire & Rubber Co., com	250	260	448	452
Goodyear Tire & Rubber Co., pfd	104	106½	104	105
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	10
International Motor Co., pfd	..	..	40	60
Lozier Motor Company	..	..	..	33
Miller Rubber Company	..	..	170	175
Packard Motor Company, pfd	104	107	103	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	40	44	33	35
Pope Manufacturing Co., pfd	67	70	78	80
Reo Motor Truck Company	8	10	10	11
Reo Motor Car Company	23	25	20¼	21
Studebaker Company, common	..	..	33	35
Studebaker Company, preferred	..	..	92	95
Swinehart Tire Company	..	..	110	112
Rubber Goods Mfg. Company, pfd	100	100	104	108
U. S. Motor Company, com	..	..	..	..
U. S. Motor Company, pfd	..	..	..	..
White Company, preferred	..	..	105	108
Willys-Overland Company, com	..	..	72	73
Willys-Overland Company, pfd	..	..	98	99

Michigan Magneto Company Bankrupt

DETROIT, MICH., Jan. 20—The Michigan Magneto Company, 117 Bagley avenue, has filed a voluntary petition in bankruptcy in the United States District Court at Detroit. Upon petition of the Stackpole Battery Company, of Pittsburgh, Pa., Judge Arthur J. Tuttle has appointed Charles C. Simons receiver with orders to sell the property of the company January 30 at 10 o'clock in the morning. Simons' bond as receiver has been fixed at $5,000.

In its petition to be declared bankrupt the company set up that it owes debts which it is unable to pay in full and that it is willing to surrender such property as is not exempt under the bankruptcy laws for the benefit of its creditors. Its debts include $44.73 as taxes due the city of Detroit, and $135.17 as wages due employes. The liabilities are given as $31,050.26 and the assets as $28,415.85.

In the list of unsecured creditors appears the name of the J. S. Bretz Company, of New York, $5,027.25 (notes) and the Reo Motor Car Company, of Lansing, Mich., $800 (notes). In the schedule of assets, the company lists machinery, office fixtures, dies, etc., the petition stating that the figures given in the schedule were the cost prices, that the machinery has been used a long time, that the merchandise is special material of no market value, as also are the patterns and dies. Certain of the machinery, the company sets up, is owned on title contracts on which a balance is yet unpaid. The company declares that outside of the list of assets given there are assets totaling $7,902.05, of which the greater portion is doubtful or uncollectable.

To Organize New Tire Company

AKRON, O., Jan. 18—What is to be known as the Mohawk Rubber Company, with a capitalization of $350,000 is to be organized in a few days. Of this amount $250,000 will be common stock and $100,000 7 per cent. cumulative preferred stock. Organizers of the new company are: R. M. Pillmore, J. K. Williams and S. S. Miller.

The new company will purchase the real estate, buildings, machinery and plant of the Stein Double Cushion Tire Company, located in East Akron, which consist of about 2.5 acres of land, a factory, switching facilities, etc., having a capacity of from 75 to 100 tires per day. This plant can be put in condition within 60 days to produce a daily output of from 75 to 100 automobile tires.

For this property the new company will pay the Stein Double Cushion Tire Company the sum of $7,500, three-fourths of which amount is to be paid in the stock of the new company at par and one-fourth cash.

Findlay Factory Sold for $50,000

FINDLAY, O., Jan. 18—The Findlay Motor Company plant was sold Thursday to J. G. Cleary, of Milwaukee, Wis., for $50,000. The sale was made under orders from the United States Court at Toledo, and sold for just the price the court stated should be the lowest bid that could be accepted. The company was promoted by L. E. Ewing, of Cleveland, who secured $100,000 of local capital. The company has been in the hands of John M. Barr, as receiver, since September 19, 1911.

It is the intention of Mr. Cleary to dismantle the plant and remove the machinery to Milwaukee, Wis., where it will be used in other industries.

Day Company Elects Officers

DETROIT, MICH., Jan. 18—At the annual meeting of the Day Automobile Company the following officers were elected: President, Thomas W. Day; director and factory manager, A. W. A. Bartlett; secretary, William S. Power; treasurer, John E. Murphy; director, William J. Emery.

Stewart-Warner Preferred Issued

The Stewart-Warner Speedometer Corporation which was recently formed by the combination of the Stewart and Clark Manufacturing Company and the Warner Instrument Company and which has a total capitalization of $11,000,000, has decided to offer $1,000,000 preferred stock to the public through White, Weld & Company, New York, Chicago and Boston brokers. The remaining $10,000,000 is common stock and is not being issued for the present, but it is very probable that the spring will see an offering to the public of the common stock as well.

The stock offered is a 7 per cent. preferred and the dividend is payable quarterly, on the first days of February, May, August and November, respectively. Three years after issue the stock which is offered at par is redeemable as a whole or in part at 110 and accrued dividend. In connection with the announcement of the stock, J. K. Stewart, president of the corporation, gave out a statement of the business done by the now affiliated companies during the past 4 years. The earnings of both companies aggregated $3,200,000 for this time, the net earnings for the fiscal year ending October 31, 1912 being $925,000. The annual dividend of both companies combined amounted to $70,000.

Easier Tone in the Rubber Market

The easier tone which developed in the world's leading crude rubber markets on Monday was still in evidence yesterday, and the reactionary tendency made further progress on both sides of the water. The demand from manufacturers at home and abroad failed to show any expansion, and, with prices weakening, consumers, it is contended, will be averse to purchasing in any other than a hand-to-mouth fashion. In London the trend of prices was downward throughout the session, though in the absence of any marked pressure to sell the net change in quotations was comparatively small. Aside from the easier tone which prevailed, the situation here underwent no change, the price remaining at $1.06 a pound.

Peerless Declares Stock Dividend

A substantial stock dividend, payable out of the surplus in the common stock of the company, has been declared by directors of the Peerless Motor Car Company, Cleveland, O. This action follows the announcement of an increase in capital stock which enables the Peerless company to provide for the rapid extension of the business.

The company starts the new year with a paid-in capital stock of $4,200,000 and assets, after deducting all liabilities of every kind, of between $5,000,000 and $6,000,000, exclusive of patents, trade marks and good will.

Michigan Company Changes Name

The name of the Michigan Automobile Company, Ltd., Kalamazoo, Mich., has been changed to Fuller & Sons Manufacturing Company. This change was desirable on account of the confusion existing due to the recent incorporation of the Michigan Motor Car Company of the same city which is owned by the Michigan Buggy Company.

F. D. Fuller retains the presidency of the new company, which position he has held ever since the Michigan Automobile Company was incorporated 10 years ago. L. C. Fuller is secretary and treasurer, while W. P. Fuller is sales manager. The capital stock of the concern is $100,000.

DETROIT, MICH., Jan. 20—Fire of unknown origin January 17 destroyed the brass and aluminum foundry of the Buick company, at Flint, with a loss estimated at $50,000. The foundry will be rebuilt at once and only a few men will be laid off temporarily. The loss of the foundry will not hamper the Buick plant to any extent as enough castings are on hand to run the plant until arrangements can be made for getting more.

Buy Grabowsky Property

Stockholders of Seitz Automobile Transmission Company Purchase Everything Except Buildings and Machinery

Will Begin Operations in Separate Plant at Wyandotte, Mich.—Samuel Winternitz & Company Buy Assets

DETROIT, MICH., Jan. 20—Stockholders of the Seitz Automobile Transmission Company, Wyandotte, Mich., have purchased the property of the bankrupt Grabowsky Power Wagon Company, of Detroit, with the exception of the buildings and machinery, and began operations in a separate plant at Wyandotte, January 20. The Wyandotte plant is to manufacture the Grabowsky truck. The Seitz company officers are to resign and the company is to be reorganized to become successor to the Grabowsky company.

For the present George A. Horner, who has been manager of the Grabowsky Detroit plant for the creditors, will be general manager of the Grabowsky plant at Wyandotte, in which the Grabowsky trucks will be manufactured.

The sale of the assets to the Seitz stockholders was made by Referee Lee Joslyn, of the bankruptcy department of the United States court at Detroit and the sale has been confirmed. The assets not covered in the Seitz transaction were purchased by Samuel Winternitz & Company, of Chicago.

SYRACUSE, N. Y., Jan. 18—The United States Tire Company has selected this city as the home of one of its sub-branches. It is at 696 S. Salina street and George A. Fish, heretofore connected with the Hartford branch, is in charge.

Market Changes for the Week

The gradual decline in price of tin was the most important market change of the week; starting at $51.10 on Wednesday and falling to $50.25 yesterday, a loss of $.85. Raw silk from Italy and Japan suffered and gained respectively, that from Italy $.05, and from Japan $.02 1-2. Domestic scrap rubber remained in a steady position throughout the week, collections still reported to be light and stocks are apparently small. A moderate inquiry is being received from domestic reclaimers and fairly large shipments are being made abroad.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony per lb.	.08¾	.08¾	.08¾	.08¾	.08¾	.08¾	.....
Beams & Channels, per 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	.....
Bessemer Steel, Pittsburgh, ton.	28.50	28.50	28.50	28.50	28.50	28.50	.....
Copper Elec., per lb.	.16⅛	.16 3/10	.16 3/10	.17 3/10	.16⅜	.16	—.00⅛
Copper Lake, per lb.	.16⅛	.16⅛	.16⅛	.16⅛	.16¼	.16¼	—.00¼
Cottonseed Oil, Jan., per bbl.	6.15	6.12	6.12	6.26	6.24	6.26	+.11
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	.....
Fish Oil (Menhaden) Brown	.33	.33	.33	.33	.33	.33	.....
Gasoline, Auto, 200 lbs. @	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	4.30	4.30	4.30	4.30	4.30	4.30	.....
Linseed Oil, prime	.47	.47	.47	.47	.47	.47	.....
Open-Hearth Steel, per ton	29.00	29.00	29.00	29.00	29.00	29.00	.....
Petroleum, bbl., Kansas crude	.83	.83	.83	.83	.83	.83	.....
Petroleum, bbl., Pa. crude	2.05	2.05	2.05	2.05	2.05	2.05	.....
Rapeseed Oil, Refined	.68	.68	.68	.68	.68	.68	.....
Silk Raw, Italy	....	4.35	....	....	4.35	4.30	—.05
Silk, Raw, Japan	....	37½	....	....	3.72½	3.75	+.02½
Sulphuric Acid, 60 Beaumé	.90	.90	.90	.90	.90	.90	.....
Tin, per 100 lb.	51.10	50.88	50.80	50.75	50.63	50.25	—.85
Tire Scrap	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.....

Complaint Discussed in Rose Patent Suit

Court Rules Design Patents on Which Infringement Was Charged Are Both Invalid

Batavia Tire Serves Notice of Infringement—Receivership for Searchlight—Petition Against Randolph

A DECISION rendered in the United States District Court for the District of New Jersey by Judge Cross in the suit of the Rose Manufacturing Company vs. the E. A. Whitehouse Manufacturing Company and the Le Compte Manufacturing Company dismissed the bill of complaint with costs. The bill alleged infringement of the Rosenbluth and Hughes patents owned by the Rose company by the defendants. The decision:

"There are four patents involved in this suit, two of which are mechanical patents and two design patents. The bill of complaint alleges that they are all owned by the complainant and have all been infringed by the defendants. The defendants not only deny this, but deny their validity. The mechanical patents are Nos. 883,973, issued April 7, 1908, to one E. M. Rosenbluth, for a lamp bracket, and No. 962,220, issued June 21, 1910, to one W. B. Hughes, for a number-plate support for vehicles. The design patents were both issued to E. M. Rosenbluth May 16, 1911, for vehicle number-plate supports and another, respectively, 41,388 and 41,389 * * *

"In behalf of the defendants, it is strenuously argued that this patent is invalid for various reasons, but especially in view of the prior art. It is quite apparent that if it discloses invention, it is of a low order. Briefly stated, the device consists of a bracket, comprising a base, by which it may be affixed to an automobile or other vehicle, and two arms, one of which carried a number plate or sign and the other a lamp, whereby the plate or sign may be illuminated when desired. These arms are made relatively adjustable with each other. * * *

"It is hard to understand why a problem of that character should have proved knotty, if it did, in the first instance; but, however, that may have been, all difficulty was resolved, when Rosenbluth undertook its solution, by the teachings of the prior art which showed similar devices of various kinds; for instance, a bracket attached to a bed, one arm of which carried a table and the other a lamp which illuminated the table. * * *

"The idea embodied in the patent under consideration, taken by itself, is of the simplest character and of questionable patent ability, but when in addition to that fact the prior art, in analogous matters, is considered, it becomes manifest that the attempt further to dilute this simple idea and then protect it by means of a patent, should not be fostered, Rosenbluth, giving him the utmost credit to which he is entitled, merely what was simple and old and common-place in analogous arts and applied it to a new use. Everything that he did had already been done in substantially the same way, although the device had not been applied to an automobile. * * *

"The patent to Hughes, claims 5 and 6 of which are in controversy, shows no patentable advance upon Rosenbluth, hence whether that patent were valid or invalid, the one to Hughes could not be upheld. Rosenbluth's patent of itself would defeat it. * * *

"The design patents are both invalid. The statute authorizes the issue of such a patent under certain conditions, to 'any person who has invented any new, original and ornamental design for an article of manufacture.'"

Batavia Serves Infringement Notices

The following notification was served by the Batavia Rubber Company, Batavia, N. Y., through its attorneys, Holmes, Rogers and Carpenter, on the Seamless Rubber Company, New York City; the Kelley-Racine Rubber Company, Racine, Wis.; United & Globe Rubber Manufacturing Companies, Trenton, N. J.; Stein Laplock Tire Company, New York City; C. H. Stoddard Rubber Tire Works, Rochester, Mass.:

"You are hereby notified that you are infringing upon the rights of the Batavia Rubber Company in the making of a non-skid tire which is so close an imitation of the 'Security' non-skid tire, which has been made by the Batavia Rubber Company for many years, as to deceive purchasers seeking Batavia tires, and you will be held accountable by suits at law for any damages.

"We will wait a reasonable time for your notification that you will cease further infringement."

Friendly Receivership for Searchlight

CHICAGO, ILL., Jan. 20—Friendly receivership has been adopted as a means of complete reorganization by the Searchlight Gas Company, Warren, O., whose general offices are in Chicago. At the petition of the Continental and Commercial National Bank of Chicago, Horace B. Pearson was appointed receiver by United States Judge William L. Day. The bank appraises the liabilities of the company at $200,000, a part of which is in notes due, and assets to the amount of $400,000, not all of which is available for immediate conversion into cash.

The present financial condition is not one of insolvency, but of temporary embarrassment, and is attributed by the receiver to the service expansion that has been carried on by the concern in such volume as to exceed the adequacy of the capital of the company. As the maintenance of service stations is one of the principal essentials of the business, this expansion is regarded as indispensable to the welfare of the business, it is thought that a general rehabilitation of the financial condition of the company will be beneficial. The receiver will continue active business.

Petition Filed Against Randolph Company

CHICAGO, ILL., Jan. 20—Proceedings in involuntary bankruptcy have been instigated, involving the Randolph Motor Car Company, Chicago, and Flint, Mich., a corporation of Delaware. The petition was filed January 3 by the Mercantile Printing Company, Charles Cramer, C. Klare, and one Robyn, the last three commission salesmen; it was recorded January 8. The Central Trust Company, of Chicago, was appointed receiver for the district of Illinois and southern Michigan.

Knox Company to Reorganize

SPRINGFIELD, MASS.—(*Special Telegram*)—The Knox Automobile Company of this city, which has been operating under a trusteeship for the past 4 months, due to technicalities caused by the death of the late A. N. Mayo, treasurer of the company, is at present on the eve of reorganization with increased capital, and when such is completed will be known as the Knox Motor Car Company. Sufficient new capital is already subscribed to make it possible for the concern to largely increase its output and to further facilitate this the number of passenger car models will be reduced and their output proportionately increased.

In order to achieve the formation of the Knox Motor Car Company it will be necessary to undergo formal bankruptcy proceedings, during which, however, it will not be necessary to cease manufacturing operations.

Chain Grip Injunctions Granted

On January 17 the United States District Court, Southern District of New York, issued an order enjoining the W. E. Pruden Hardware Company, of New York City, from selling unlicensed cross chains, cross chain hooks, side chains, side chain hooks and other parts adapted and intended for use in the manufacture and repair of tire chain grips. The suit had been brought by the Wood Chain Tire Grip Company, New York City, under the Parsons patent No. 723,299.

Judge Lacombe, of the above-mentioned court, issued an order the same day enjoining the Q. D. Hook Company, Edwin S. Holmes, Jr., Randolph T. Warwick, Charles Bauer and Leon Tobiner from making and selling the Q. D. cross chain hook, made under a patent of Edwin S. Holmes, Jr.

M. & A. M. Elects Officers

At the tenth annual meeting of the Motor and Accessory Manufacturers, held at the Waldorf-Astoria, January 15, at 5:30 p. m., there was a very representative attendance of members. In addition to the reading of the reports by the retiring president, treasurer and chairmen of the various committees, the following were elected as members of the board of directors, to serve 3 years: C. E. Thompson, of the Electric Welding Products Company; Alfred P. Sloan, Jr., of the Hyatt Roller Bearing Company; F. Hallett Lovell, Jr., of the Lovell-McConnell Manu-

facturing Company, and C. E. Whitney, of the Whitney Manufacturing Company.

These gentlemen succeeded the following, whose terms expired:

D. J. Post, Veeder Manufacturing Company; H. W. Chapin, Brown-Lipe-Capin Company; C. T. Byrne, Byrne, Kingston & Company, and C. E. Whitney, Whitney Manufacturing Company.

At the meeting of the board of directors, held in the headquarters on January 16, the following officers were elected to serve for the ensuing year: President, J. H. Foster, Hydraulic Pressed Steel Company; first vice-president, F. Hallett, Lovell, Jr., Lovell-McConnell Manufacturing Company; second vice-president, C. E. Whitney, Whitney Manufacturing Company; third vice-president, F. C. Billings, Billings and Spencer Company; treasurer, L. M. Wainwright, Diamond Chain & Manufacturing Company; secretary and assistant treasurer, Alfred P. Sloan, Jr., the Hyatt Roller Bearing Company. William M. Sweet continues as manager.

Maryland Owners Must Pay D. C. Fee

WASHINGTON, D. C., Jan. 18—After having contributed more than $50,000 to the coffers of Maryland for the privilege of using Maryland roads, the automobile owners of the District of Columbia have at last been abled to retaliate for the alleged bad treatment they have been subjected to for several years. The district commissioners have adopted new regulations, which will become effective February 1 next, compelling all Maryland motor car owners to pay a license fee to the district equivalent to the fee which they pay the state, in complete disregard of the fact that Virginia, Pennsylvania and, in fact all other states that grant reciprocity, can have the motor cars of the citizens of those states enter the District of Columbia without the payment of any license fee and despite the further fact that the district license is only $2 and is perpetual.

In other words, Maryland motor car owners must pay the same license fees exacted of residents of the state.

Emise Motor Car Company Formed

Several members of the old Lozier Motor Company organization and one or two who are at present connected with the concern have organized a company to manufacture a counterpart of the present Lozier light six under the name of the Emise Motor Car Company. It is understood that the company will be formed in Cleveland, O., and that the car will be made to sell at a figure below $2,000. Officers of the new company will include: C. A. Emise, former sales manager of the Lozier company; Sam Regar, former treasurer; W. S. Mead, former sales manager of the New York Lozier branch, and F. C. Chandier, former second vice-president to the Lozier company. The engineer will be T. V. Whitback. Organization plans contemplate the manufacture of about 5,000 machines for the coming year.

Alleges Sparton Infringement

The Lovell-McConnell Manufacturing Company, Newark, N. J., is suing the Jackson Eastern Distributers, Haynes Automobile Company and Garland Auto Company, all of New York City, alleging infringement of the Klaxon patents by the use of the Sparton horn. The first company has also filed suit against the Sparks-Withington Company, Jackson, Mich., maker of this horn.

N. A. A. M. Versus Tire Fillers

The National Association of Automobile Manufacturers on January 8 passed the following resolution:

"That members of this association will withdraw from their warranty all cars in whose pneumatic tires there has been any substitution for the usual air cushion."

Horn Decision Upheld By Court of Appeals

Lovell-McConnell Alleges That International Automobile League Is Selling Horns for Less Than Retail Price

Lower Court Grants Certain Prayers for Preliminary Injunction But Denies Others

JUDGE LACOMBE, of the United States Circuit Court of Appeals, Second Circuit, New York, in the suit of Lovell-McConnell Manufacturing Company, of Newark, N. J., *vs.* the International Automobile League, of Buffalo, N. Y., has rendered an opinion upholding the decision of the lower court with some modifications. The lower court granted certain of the prayers for a preliminary injunction but denied other prayers of the bill. The complainants asked for an order restraining the defendants from selling Klaxon horns for less than the retail price stated on the contract, under which the horns are sold to the distributer, as which the International Automobile League acts, so far as its members are concerned. The opinion is, in substance, as follows:

"The complainants make automobile horns (the Klaxon horn) under a patent and sell the same to dealers under a complicated form of license which, among other things, provides that the purchasers shall not resell at less than a stated price. The injunction which was issued prohibits defendants from 'selling or offering for sale, directly or indirectly, any of complainants' horns marketed and sold by complainants under their conditional licenses set forth in tags or labels upon or secured to said horns, for less than the price designated by complainants at which said horns must be sold to the public, as shown by the tags and labels secured to said horns by the complainants.'

"It is not necessary to set forth the various other preliminary injunctions which complainants now ask for, because in our opinion they are of the sort that should be considered only at final hearing, especially because complainant's theory as to this additional relief apparently is that there has been some forfeiture of license, so that the defendant is to be regarded as never having had a license and, therefore, as an infringer. Since the answer attacks the validity of the patent, which defendant may properly do if he is not a licensee, and an extensive prior art is set up, the questions raised upon this argument should be left for disposition at final hearing.

"In one particular, however, complainants are entitled to some further relief.

"The defendant is a concern operated on a membership and profit-sharing plan whereby each member is obliged to pay a membership fee of $10. It buys various automobile fittings and accessories at manufacturers' prices, and before this injunction sold these horns to its own members at a considerable abatement from the price fixed by manufacturer for sale to the public.

"After the injunction was issued it sent a circular to all its members notifying them that it could no longer sell horns to them at cut prices. The same circular included the following offer:

" 'While the Klaxon people may insist upon the League charging its members the retail price, they surely cannot prevent the League giving the profits to charity. If you are insistent upon having a Klaxon send us your check for the full retail price, as given above. We will sell it at no other price. Then give us the name of two charitable institutions in your vicinity deserving of assistance, and we will select one of them and draw our check to its order for the difference between the cost to us and the retail price, forwarding the check in your care so that we may be sure it will reach its proper destination.'

"This seems to be a very flimsy device for evading obedience to the injunction against cutting prices. Most of the individuals whose condition in life is such that they can afford to own and use automobiles are presumably in the habit of making regular contributions at stated periods to one or more worthy charitable institutions. When defendant tells them that if they will buy from it Klaxon horns at the price they must pay everywhere else, it will send them a check for $8 or $9 on each horn drawn to the order of such charitable institution as they may designate, it is naturally to be expected that they will accept the offer, will take the draft, add to it sufficient to make up their usual contribution and pass the same on to the institution.

"Probably there are other persons whose charitable vision is bounded by the horizon of themselves and their individual families. It would be an easy thing for one of them to send on two fictitious titles of what seemingly are charitable institutions, but which in reality represent merely the distress produced in this family by the payment of the full list price for a Klaxon horn. Upon receiving the draft he could write the fictitious name of the payee, and then indorse, deposit and collect it in his own name. The suggestion that defendant would undertake any investigation to discover whether or not the selected 'charitable institution' is real or fictitious puts a severe strain on one's credulity We think this devotion of the discount from list price to 'charitable institutions' is a mere evasion of the order and that the present injunction should be modified by inserting a clause which will put a stop to the practice.

"As thus modified the order is affirmed, without costs."

Grand Prix Date Fixed

On July 12 the 19-Mile Course Near Amiens Will See Fuel Consumption Contest

Indianapolis Busy Preparing Memorial Day Race—Southern Touring Course Planned

PARIS, Jan. 12—Saturday, July 12, has been fixed for the French Grand Prix fuel consumption race to be held on the 19-mile course near Amiens. It has been decided that the course will be covered twenty-nine times, which will give an approximate total distance of 563 miles. For this distance, the fuel allowance will be 40 gallons, the rules stipulating that cars shall not consume more than 1 gallon per 14.1 miles. The whole of the fuel must be on the car at the start of the race. The exact length of the course will not be known until it has been decided how the hairpin turn at the Amiens end will be treated. It is probable that instead of taking the cars around the present bend a special semi-circular banked track will be built uniting the two parallel roads. This bend will be so designed that cars can pass from the first to the second leg of the course at high speed, and as the main grandstands will be built around the outside of the banked turn, true autodrome conditions will be secured. Probably the pits will be on the straightaway just after the banked turn.

It is probable that Mercedes cars will come into the race. The English agent of the German Mercedes Company has made an entry, but this has been temporarily refused by the racing board, on the ground that only manufacturers can take part in the race. If, however, the parent company makes no objection to the agent running these cars, they will be admitted by the French Club. It is also probable that one or two Turcat-Mery cars will be entered for the Grand Prix.

Very few of the drivers have yet been selected for the race. The Peugeot team will consist of Georges Boillot, Jules Goux, and Zuccarelli. Sunbeam has decided to have two English and two French drivers. The former will be W. Lee Guinness and D. Resta, and the latter Victor Rigal and M. Caillois. Delage has selected Albert Guyot as one of his drivers; the second has not yet been appointed. Two of the Schneider drivers will be Champoiseau and Croquet, who drove for this firm last year; the third man has not been selected. Arthur Duray will probably be at the wheel of the Turcat-Mery car about to be entered. Christiaens will drive the six-cylinder Excelsior. The old time cracks Wagner and Hemery will probably sign on with some of the foreign firms.

It is now practically decided that the Grand Prix will be followed by a motorcycle and cyclecar race on the same course. The conditions for this have not yet been decided on, and no official announcement regarding the race has yet been made.

Columbus To Have 200-Mile Race

COLUMBUS, O., Jan. 18—The Columbus Automobile Club has asked for a sanction to give a race meet at the track of the Columbus Driving Association, Labor Day and committees to have charge of the arrangements will be named in the near future. It is proposed to give a 200-mile race, like the one in 1912, which was such a huge success in every way.

Only 1 Day of Racing at Speedway

INDIANAPOLIS, IND., Jan. 20—The management of the Indianapolis Motor Speedway has decided that there shall be but 1 day of racing at the May meet to be held at the Speedway. This will be on Memorial Day—May 30—and the only vent will be the 500-mile international sweepstakes for cars of 450 cubic inches piston displacement and under.

Some time ago the management contemplated a 2-day meet, with a number of shorter events for 1 day and the 500-mile race the next. After consulting with manufacturers, it has been deemed wise to limit the meet to 1 day and one event.

The Nyberg Motor Car Company, Anderson, Ind., has entered a Nyberg car for the race and has nominated Harry Endicott as driver. This makes three entries to date with prospects bright for a large number of additional entries before many days. Endicott drove a Schacht in the race last year, finishing in fifth place. The Nyberg entered has a 4-inch bore and 5-inch stroke, with a piston displacement of 389 cubic inches.

The sale of tickets for the race has opened and it is reported that the demand for seats far exceeds last year's.

Billy Knipper, of race-driving fame, will pilot a Henderson car in the Indianapolis race on Memorial Day. He is at present the Rochester, N. Y., representative of the Henderson Motor Car Company.

Bob Burman, the speed king, has signed a contract to drive a Keeton 6-48 in the 500-mile race at Indianapolis on May 30.

L. I. A. C. Run on Washington's Birthday

Members of the Long Island Automobile Club had an enjoyable time at the first smoker of the winter season on January 16, at their clubhouse in Brooklyn, N. Y. The good roads committee, A. E. Beggs, chairman, intends to begin as early as possible to place signs in the various roads in Long Island. J. Auer, chairman of the committee, announces that the first run will be to some point within a radius of 15 miles on Washington's birthday. Fourteen trophies will be competed for this year.

South to Get Touring Course

ROCKPORT, TEX., Jan. 18—With the increase in automobile touring in the Gulf coast country of Texas and Louisiana, particularly during the winter season, the idea of providing additional facilities for this pleasure has taken shape in the proposition of establishing a beach speedway that will be more than one thousand miles long. This prospective automobile touring course will start from a point on Atchafalaya Bay, on the Louisiana coast, and will run to the mouth of the Rio Grande.

Minneapolis After A. A. A. Run

MINNEAPOLIS, MINN., Jan. 18—The trustees of the automobile club of Minneapolis have voted to make formal invitation to have the 1913 A. A. A. reliability tour start in the Twin Cities. The contest committee, Dr. H. F. Marston, chairman, has been instructed to ask the Civic and Commerce Association, the aggregation of business men, to back the invitation. The state association has already had an invitation from the Black Hills motorists and commercial clubs to tour west to the Yellowstone Park through that district.

To Abate Cayuga Ferry Nuisance

SYRACUSE, N. Y., Jan. 18—Senator J. Henry Walters has successfully taken up with the State Highway Department the matter of complaints against the private ferry across the foot of Cayuga Lake on the Auburn-Cayuga state road, much used by through tourists. For several years automobilists have been forced to pay heavy charges to cross the ferry and Syracuse and other automobilists have vigorously protested. The Highway Department announces that it will improve a road making a detour and crossing the ferry will be unnecessary until a new through route now in process, is completed.

Quakers See 300 Cars

In 30,000 Square Feet, Products of Sixty-nine Factories Are Displayed at Philadelphia

Two Shows for Providence—Davenport Will Have Big Show—Baltimore's Exhibition

PHILADELPHIA, PA., Jan. 18—With no formal ceremony beyond the turning on of the switch that loosed a flood of light throughout the building, the twelfth annual Automobile Show, conducted under the auspices of the Philadelphia Automobile Trade Association, opened tonight in the new garage of the Automobile Club of Philadelphia. The exhibition will continue for a fortnight, the first week being devoted to pleasure cars, both gasoline and electric, and accessories. The second week commercial vehicles will be on view, together with a hold-over accessories display.

Three floors, each containing approximately 30,000 square feet, are given over to the display. This is far more space than has heretofore been available in both the old armories combined, but it was needed, for in the number of exhibits, variety and completeness, it is the most comprehensive and representative show ever held in Philadelphia, and if first-night attendance is any criterion it will set a mark hitherto unapproached. Notwithstanding blustery winds and a drizzling rain enthusiasts kept pouring into the show building by the hundreds, until, at its height, large as is the structure, with two huge elevators, wide stairway and roomy aisles, all avenues of progression were literally choked.

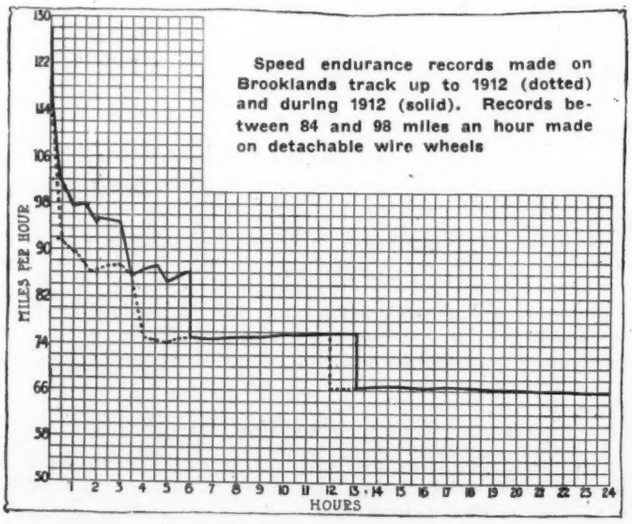
Sixty-nine separate makes of American gasoline and electric pleasure cars, showing in all about 300 automobiles, together with twenty-five accessories dealers, presenting a more varied array of motor car incidentals than has ever been assembled before in Philadelphia, comprise the exhibition.

With the exception of varying changes in body design, especially in closed car types, no radical departures in mechanical construction are apparent.

It would be difficult to conceive of a more satisfactory home for the show. Lending itself admirably to the purpose, the art of the decorator has transformed each of the three floors into bowers of beauty. Furnishing opportunities not possible in former years, advantage has been taken to make the settings of the show more elaborate. The first floor has been converted into an Italian garden, scattered about which are Venetian urns mounted with mosaic globes lined with electric lights. Overhead are streamers of leaves, caught up from pillar to pillar with ornamental wreaths. On the second floor is portrayed an autumn scene, with pergola and trellis effects, the blank wall being covered with a road scene in which the automobile occupies a conspicuous position.

On the third floor are California scenes. Overhead is sky, through which peep electric bulbs in the form of stars. Around three walls is a representation of an old Spanish wall, the fourth containing a California landscape. On each of the floors an orchestra discourses music throughout the evening. The orchestral music is varied by the interpolation of xylophone solos, vocal solos and the playing of bells, scattered around the room, from an electric keyboard.

As has been the yearly custom, one day in the week has been set apart as Society Day, on which the price of admission will be doubled, and special features will mark other days. Next Thursday will be Society Day and on Wednesday night next the 1,600 members of the Automobile Club of Philadelphia have been invited to attend the show.


Speed endurance records made on Brooklands track up to 1912 (dotted) and during 1912 (solid). Records between 84 and 98 miles an hour made on detachable wire wheels
MILES PER HOUR
HOURS

Two Shows To Be Held at Providence

PROVIDENCE, R. I., Jan. 20—Providence, R. I., is to have two motor car shows during the week of January 25 to February 1 inclusive, according to plans that have been worked out. The one to be held by the Rhode Island Automobile Dealers' Association is to take place in the State armory.

Columbus Show Dates March 8-15

COLUMBUS, O., Jan. 18—Arrangements have been completed by the joint committee representing the Columbus Automobile Club and the Columbus Automobile Trades Association to give the annual Columbus automobile show in the Billy Sunday tabernacle, on West Goodale street for the week beginning March 8. The tabernacle, where Evangelist Sunday is holding a revival service, is one of the largest structures ever erected in the Buckeye Capital. It will give more floor space than was ever given in any previous show.

Syracuse Show in One Building

SYRACUSE, N. Y., Jan. 18—The board of directors of The Syracuse Automobile Dealers' Association has decided to confine this year's automobile show, February 25 to March 1 to the Armory, instead of holding the overflow in the Alhambra, as was done last year. There will be space for all the exhibits under one roof, owing to the fact that the part used by Troop D is to be used for the first time in addition to the portion belonging to Company C.

Davenport Show Will Be Big

DAVENPORT, IA., Jan. 18—Owing to the large demand for exhibit space the arrangements committee in charge of the annual show of the Tri-City Automobile Dealers' Association, have decided to exclude all dealers outside of the three cities. Space will be alloted this week. Preparations are being made to make the 1913 show the biggest ever held here. The Tri-City Automobile Dealers' Association was only recently incorporated for $10,000.

Forty-Nine to Show at Baltimore

BALTIMORE, MD., Jan. 20—There will be forty-nine exhibitors at the motor car show to be held in this city February 18 to 22 in Fifth Regiment Armory. These will include thirty-two pleasure car firms and seventeen commercial car dealers. The drawing for space will be held January 22.

Badgers After New Law

Signal Use, Registration and Penalties for Car Theft Among the Chief Points Proposed by State Association

Packard and Willys Give $150,000 Each for the Building of the Transcontinental Stone Road

MILWAUKEE, WIS., Jan. 17—A legislative campaign was outlined and authorized by the Wisconsin State Automobile Association at its sixth annual meeting in Milwaukee on January 15. The board of directors was directed to pursue effort to secure new laws at the hands of the Wisconsin Legislature, now sitting, on approximately the following distinct points:

a. Universal light law, requiring every vehicle in Wisconsin to carry a light at night. Now required by city of Milwaukee.

b. One registration per year per owner, instead of a registration covering the specific car owned at the time application for registration is made, so that if a man purchases a new car and disposes of his old one within any year, the old license will remain in force until January 1 next.

c. Uniform signal law, requiring all motor cars to be equipped with a distinctive warning signal peculiar to motor cars as a whole, as for instance, an electric horn with a harsh note.

d. Heavier penalities for theft of cars, for joy riders, and for chauffeurs who railroad owner's cars.

It was decided to oppose any attempt to impose a tax based on weight or horsepower; to change present laws limiting speed, or interference with any present good roads legislation which would make the movement for permanent highways less effective.

The board of directors was authorized to proceed with arrangements for the fourth annual Wisconsin reliability tour, to be conducted next July. It is intimated that the tour will be changed from an exclusively trade proposition to one for amateurs, the deed of gift of the $1,000 *Sentinel* trophy to be changed by Charles F. Pfister to make this possible.

A. B. of T. 1913 Handbook Is Out

The Handbook of Gasoline Automobiles for 1913 issued by the Automobile Board of Trade is just off the press. It is compiled in the same standard form as in previous years. The descriptions of machines therein contained are sufficiently complete for the average purpose of reference and the illustrations which accompany the specifications clearly describe the body styles of the various models. Exclusive of catalogue request blanks which are placed at the end, the book contains 187 pages of extremely useful information. There are 146 pages devoted to descriptions of pleasure cars and twenty-seven pages on gasoline trucks. In order to make comparison between different makes as simple as possible, the same form of specification is used in each case. Another point that has received attention is contained in a footnote at the bottom of each page giving the equipment that is included in the list price. In addition to the lists of officers of the A. B. of T. there are alphabetical indexes to the names of the manufacturers as well as the names of the cars. The handbook should form an invaluable *vade-mecum* for present and future reference.

First Annual Breakfast of Motor Truck Club

The first annual breakfast of the Motor Truck Club was held at George Rector's in New York City Tuesday, January 21. The attendance exceeded all expectations to such an extent that the committee was scarcely able to provide sufficient accommodation. David C. Fenner, president of the club, officiated as toastmaster, introducing the following speakers: F. F. Beall, of the Packard Motor Car Company, who spoke on Production as one who knows his subject; E. W. Curtis, Jr., of the General Vehicle Company, who read P. D. Wagoner's paper on Advertising and Selling, Mr. Wagoner being absent on account of illness; Elisha Flagg, Jr., was also absent but sent his paper, which was ably read by the club's secretary, E. L. Howland; George H. Duck, general service manager of the Alco, gave a very interesting talk on service, enlivened by bits of humor; Walter Wardrop, editor of *Power Wagon*, was the last speaker and treated his subject, Past, Present, Future, in a very interesting manner. The occasion was a great success and augurs well for the continuance of the function as an annual affair.

Packard Contributes $150,000 to Road

The Packard Motor Car Company, of Detroit, Mich., has agreed to contribute $150,000 for the construction of the transcontinental stone road. This sum represents a little less than 1 per cent. of the company's gross business done June, 1912.

It has not been decided yet whether this sum will be paid all at once or in three annual installments, but the contribution is subject to the following three conditions:

1. It is to be paid only in case of sufficient funds being subscribed for the construction of the entire road scheme.

2. The engineering of the work must be supervized by government engineers.

3. The states through which the road is to be laid contribute the labor.

The latter condition is merely for the purpose of insuring the proper use of the fund contributed.

Willys Gives $150,000 for Stone Road

John North Willys, president of the Overland company, has donated the sum of $150,000 to the fund which is being raised for the purpose of constructing a national highway from one coast to the other. This donation is to be paid in three instalments of $50,000 each, payable during 1913, 1914 and 1915.

Des Moines Dealers Elect Officers

DES MOINES, IA., Jan. 20—The Des Moines Auto Dealers' Association held its annual meeting this week and elected the following officers: President, W. E. Moyer; vice-president, Dean Schooler; secretary, C. G. Van Vliet; treasurer, C. L. Horring; directors, W. W. Sears, C. G. Van Vliet, R. J. Clemons and V. W. Reynolds. On account of the illness of President Moyer the office of vice-president was created and Mr. Schooler will take active charge of the preparations for the fourth annual show, which opens at the Coliseum March 3.

Form National Highway Branch

YUMA, ARIZ., Jan. 20—At a meeting of more than 100 delegates from Arizona and the extreme southern section of California held here on January 8 there was formed the San Diego-Arizona auxiliary of the Southern National Highway Association. The special purpose of this organization is to promote the construction of a highway bridge across the Colorado River at Yuma. The proposed structure will cost about $75,000, of which sum the new organization pledges itself to contribute $50,000.

Savannah Owners to Pay for Roads

SAVANNAH, GA., Jan. 20—There is a growing feeling, chiefly among non-automobilists, that those who own automobiles should be required to meet more of the road expenses. From current

talk this feeling is going to take definite form and shape when the legislature meets again this summer.

One difficulty encountered is the proper apportionment of the receipts from such a tax. Shall it go to the state or to the counties? Or shall part of it go to the state and part to the counties? These are questions which, of course, the legislature will have to decide. The people appear quite determined, however, that since the automobilists are the chief users of the roads, they should pay more toward their upkeep and improvement.

Secretary of State, Philip Cook, in the course of his investigations has discovered in one county where there are 177 automobiles registered that only nine of them have been returned for ad valorem taxation. He has found similar situations in other counties. This matter also will be brought to the attention of the legislators.

Electric Vehicle Association Banquet Is Success

One of the most successful affairs in the history of the Electric Vehicle Association of America was the testimonial banquet tendered to Past-President William H. Blood, Jr., at Delmonico's on the evening of Thursday, January 16. There was not a dull moment from oysters to demi-tasse and after that any one present would have thought that such a thing as "dull care" never existed. It was perhaps the most representative gathering of electric vehicle and central station men that ever assembled in New York City for a jollification in honor of one of their number. Arthur Williams, who is Mr. Blood's successor as president of the Electric Vehicle Association of America, acted as toastmaster of the evening and in proposing a toast to the guest of honor referred to his splendid efforts in behalf of the Association. Mr. Blood made a brief response in way of appreciation and among other things mentioned that the Association now represents approximately $500,000,000 of capital.

Newark's Automobile Show Plans

Next Thursday night the drawings for space allotments will be made for the Newark Automobile Show, Newark, N. J., which is to be held in the First Regiment Armory during the week of February 15-22.

Governors Represented at Convention

Twenty-nine governors have named delegates to represent their states in the second Federal Aid Good Roads Convention called by the American Automobile Association to take place in Washington, D. C., March 6.

Rhode Islanders to Hold Banquet

The Rhode Island Automobile Dealers' Association, Providence, R. I., will hold its annual banquet on Wednesday, January 29, at the Crown Hotel.

Chevrolet's Kerosene Experiment

A dispatch from Flint, Mich., states that the Chevrolet car, made by the Republic Motor Car Company, that city, will be mounted with a motor designed to use kerosene exclusively, and that the car is nearly ready for the market.

Hillman Speaks on Electric Trucks

At the meeting of the Electric Vehicle Association of America on Tuesday, W. H. Hillman, of the General Vehicle Company, read a paper on the importance of the electric truck as compared with other classes of central station work. Mr. Hillman showed the importance of the truck industry to central stations, due to current consuming ability of individual trucks and the rapidly growing number of electric freight automobiles.

London Taxicab Strike

Owing to Current Price of Gasoline 5,000 Taxicabs Have Been Removed From City Streets

Up to End of December Men Were Charged 16 Cents Per Gallon—Now Fuel Costs 25 Cents

LONDON, ENG., Jan. 13—Owing to the price of gasoline, 5,000 taxicabs have been removed from the streets. The trouble between the masters and men is that terms cannot be arranged over the price at which the drivers are to receive fuel for their cabs. Up to the end of December the men were charged 16 cents per gallon for all fuel required, but owing to the general rise, the proprietors, in accordance with the award that was drawn up last March between the masters and men with the Board of Trade, now have raised the price to 25 cents per gallon. The men refuse to pay this amount, and state that they would not be able to exist on this basis. They state that the average earning for a taxicab in London is $5 per day and out of this the proprietor takes $4.26 under the old charge of 16 cents per gallon for the gasoline, but under the new increased price he would take $4.50. Three gallons of fuel is required each day.

During the past year they state that the proprietors profit amounted to $140,000 less cost of handling, and with the increased charge this would bring them in a further profit of $65,000 for 1913. Against this the proprietors state that, and have actually taken the figures from the book of one of their employees, the amount of tips received is much better.

There are a large number of drivers who have remained loyal to their agreement of last March.

With the exception of the rush of Saturday evening for the theaters and other places of amusement, the average user of the taxi has felt little effect of the strike.

Benzol Tests Running in England

LONDON, ENG.—One of the London papers is running a series of tests on benzol. The owner and driver of a taxicab with which the test is being made drove 40 miles on this fuel under working conditions on the second day of the test, the car being fitted with a new Claudel-Hobson carbureter. He states: "I was able to approximate 22 miles on a gallon of benzol today, against 19 miles, my maximum, on gasoline. This was 1 mile better than my record of 21 miles on benzol on the first day, and the car was quite as efficient in every respect as on petrol, although I did not adjust the carbureter in any way for the new fuel. When I get used to the new carbureter I believe I shall do fully 24 miles per gallon on benzol under fair running conditions."

$12,500,000 Devoted to English Roads

LONDON, ENG.—Much useful work has been done for motorists in England by way of improving the roads over which they travel. During the last quarter of the old year the road board, with the approval of the treasury, advanced $413,610, the larger portion of which is to be devoted to road crust improvements. The total grants, after deducting cancellations, for the year amount to no less than $4,447,960, while loan advances to the extent of $633,160 have also been arranged. In addition to these vast sums of money, further advances amounting in the aggregate to $7,337,520 have also been dedicated to highway authorities toward road improvements, the details of which are not yet settled. The total, therefore, available for road improvements, amounts to the fine sum of $12,500,000.

Engineers in Session

HOWARD MARMON

Howard Marmon, elected president of the Society of Automobile Engineers at their annual meeting in New York City last week, is vice-president of the Nordyke & Marmon Company, Indianapolis, Ind. Mr. Marmon has been responsible for the design of all the Marmon cars since the advent of the company into the automobile field. He is a graduate of Leland Stanford University, and has been a leading factor in engineering and contest circles in America since his association with the industry.

Motor Testing, Exhaust Gas Analysis, Electric Wiring, Wheels and Fuels Are Discussed

Engineers Argue Relative Merits of Four and Six-Cylinder Motors—Discuss Best Gearbox Locations and Listen To Numerous Papers on Motor Design

THE annual winter meeting of the Society of Automobile Engineers held at the McAlpin Hotel, this city, was brought to a close on Saturday morning, January 18. The session was notable for the great amount of interesting and useful information which was brought to light and for the large number of prominent engineers who were in attendance and who entered into the discussions.

The Society has grown; it is now looked upon as the ultimate authority upon which engineers as a whole may rely. Realizing its great importance and increasing influence in its special line of work, automobile engineers are beginning to believe in it and are bringing to it their ideas and knowledge gained, in many cases by long years of experience along certain specialized lines. This assisting the less experienced, this spirit of co-operation is doing a great work for the industry as a whole. The idea of boosting was specially noticeable at the session just closed.

The Society's deliberations were opened on Wednesday, January 15, with the meeting of the Standards Committee at the headquarters of the organization. Here a number of division reports were considered and passed to the Society, where they were acted upon later in the week.

President Opens Session

The convention proper was opened on Thursday morning at the McAlpin by an address by President H. W. Alden. In summing up the work of the society since the summer meeting, it was pointed out that the policy has been to follow out the ideas of the late President Donaldson. The work of the standards committee was especially commended as representing the best efforts of the organization as carried on by the most able men which the industry possesses.

Mr. Alden spoke particularly of the work of the local branches, commending it as being the means of keeping up interest in the activities between the two annual meetings. Many would lose interest if they did not get together, if they were not afforded an opportunity to discuss pertinent topics more than once or twice a year. Local sections should be established in all the large cities, Mr. Alden said.

He also touched upon a movement which is on foot for the endowment of the Society and which would be large enough to carry it over periods of depression so that it would not have to depend entirely upon dues and initiation fees for its upkeep.

Financially the Society is in better shape than ever before and the outlook is rosy, due to the rapid growth of membership and prestige of the organization. The total cash on hand and in bank at the close of the year 1912 was shown by the treasurer's report to be $11,573.10 as against $2,230.04 at the end of the previous year. Total disbursements for 1912 were $28,379.32, while for 1911 about $22,000 was expended. This increase in expenditure is justified by the increase in membership and activities. The total receipts for the last three months were $17,293.58 and the disbursements for the same period amounted to $5,720.48. This sound financial condition is all the more noteworthy when it is considered that the only indebtedness of the Society is $4,000 in notes held by prominent members of the organization. This, of course, excludes the current running expenses.

Membership Grows Rapidly

The curve of increase in membership is practically a straight line and is still going straight up. The report of the tellers of election of members shows that 501 were taken in during the year, composed of various classes as follows:

Regular members	190
Associate members	233
Junior members	62
Affiliate members (11 persons designated)	5

Officers elected for the ensuing year were as follows: President, Howard Marmon; vice-president, J. G. Perrin; vice-president, Russell Huff; treasurer, Hermann F. Cuntz; members of the council, H. L. Pope, E. F. Russell and J. A. Anglada.

In tribute to the memory of the late Henry F. Donaldson, president of the Society at the time of his death, the Society appropriated from $300 to $500 for the erection of a suitable monument over the grave of the former head of the organization. The matter was brought before the Society by H. M. Swetland after it had been considered by the council and had met with that body's full approval. Mr. Swetland stated that it was desirable to have the concentrated action of the Society on such an action. Mr. Donaldson was a great man and a great writer, and it is only fitting that this tribute should be paid to his memory. The Society was unanimously in favor of the suggestion.

Society's Annual Dinner

Yet the convention activities were not all sterner business, for on Friday evening a record gathering of Society members was present at the annual banquet given in the banquet hall and the grill room of the McAlpin. Five hundred and seventeen members and their invited guests assembled at 8 o'clock for the Society's reception, after which the banquet was served.

No lengthy speeches marked the entertainment following the spread. The new president, Howard Marmon, outlined briefly the policy of the Society for the coming year, saying that he proposed to make all work. Following his opening remarks, Prof. F. R. Hutton, the only speaker of the evening, gave a short address, from which the following is an extract:

The Society's True Ideals

"The activity of your society largely depends on the work of the section, and the philosophy of this sectional work is not so much along the line of deep thought as to be up-to-the-minute information. Your sectional meetings call for knowledge of up-to-date requirements. The second great work of your society is the ideal of developing the standard. It is the development of this that relieves you from the influence of the sales manager and the advertising manager.

"Growth of membership should be the third ideal of your society, and I am pleased to note that your growth is as great if not greater than that of any of the other American engineering societies.

"The fourth ideal is that the engineer can expend less time in specialty work and more in broad views. He should be released from the petty details and be free for better and larger work in the development of materials and properties in the heat engine, along which line the art needs its greatest development. Scientific research is needed, and what our engineers require is that exact knowledge which comes from such research. My hope and dream is that our society will have a testing laboratory established in Detroit or some other city, and that it will be conducted along broad lines."

Summing up the professional work of this winter meeting, it is found that the discussions on the various pertinent subjects were particularly fruitful of valuable knowledge. Eleven committees reported and in every case progress was a feature. It was shown that the newly organized motor testing division will soon rank among the star dvisions of the standards committee. One evening was devoted entirely to four papers and discussions of motor truck subjects. An afternoon was given over almost wholly to a consideration of the value to the automobile engineer of exhaust gas analyses and related subjects. Four papers and discussion of them occupied another afternoon. These dealt with the subjects of leaf springs, the stability of propeller shafts, the effect of the relation of bore and stroke in automobile engines and the determination of brake capacity.

The broaches division report was accepted as one of progress. Consideration of new methods of spline manufacture and consequent changes of spline shaft design featured it. The ball and roller bearings and the frame sections divisions did not report. The miscellaneous division's report covered the standardization of another type of plain rod end. It also combined the specifications for height, width and length of magneto space on motors so as to apply to both four and six-cylinder engines.

The electric lighting committee provided that lamps should be 7-volt types with efficiency of 1.1 watts per candle. It also stand-

H. W. Alden, retiring president of the Society of Automobile Engineers, occupied the presidency since the death of President Donaldson, last July, and since that time has worked to carry out the plans of the late President Donaldson. Mr. Alden is chief engineer of the Timken-Detroit Axle Company

Representative gathering of members who attended the meeting held on the morning of January 17

ardized side, tail and headlights as to size. It is endeavoring to standardize storage batteries, to arrive at definite recommendations for wiring as to whether the single or the double system is preferable. It also seeks to standardize fuses and fuse boxes.

The sheet-metals division has given a specification for manganese bronze for cold rolled sheets and rods. It also is trying to reduce the number of sizes of sheets and rods used. The nomenclature division has laid out a long and difficult task for itself. It will attempt to get up a mechanical dictionary for publication in all languages so that each part will be rationally and uniformly known throughout the world. Other mechanical organizations and the United States Patent Office will undoubtedly assist at this work.

A committee has been appointed to arrive at standards for rims on account of the expected breaking up of the rim association, which will precipitate many makes of rims upon the market to the bewilderment of the engineer and the buying public. The alloys division added two specifications for gear bronzes. The wheel dimensions and fastenings for tires division will cooperate with the tire makers to decide whether or not they must revise the present stringent requirements as to rim tolerance, which now necessitate the rims being machined. The truck standards division reported progress along the line of standardization of the main related parts of the truck with respect to one another. The springs division also indicated progress. It is to endeavor to get additional information as to the distances fore and aft between spring clips for overslung and underslung springs.

Light was thrown on the consideration as to whether or not the magneto should be eliminated because of combined cranking, lighting and ignition; on the causes for the decline of the 42-inch wheel; on the subject, Will the Six Displace the Four-Cylinder Motor; on the best position for the gear box.

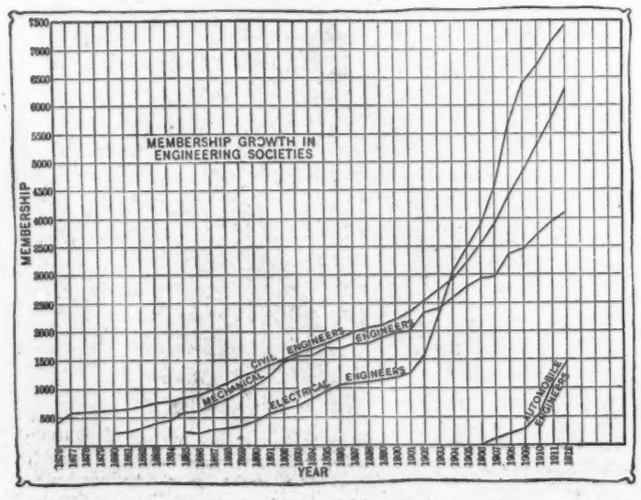


Chart illustrating growth of engineering societies, showing normal development of S. A. E. membership

Division Reports

Standards Committee Divisions and Electric Lighting Committee Reports Read and Acted Upon

S. A. E. Convention

IN addition to a business session on the opening morning of the Society's meeting, reports of several divisions of the standards committee and of the electric lighting committee were read and acted upon.

Report of the Sheet Metals Division

In addition to recommending a specification for manganese bronze for sheets and rods, the sheet metals division presented a report of its activities along the line of standardization of sizes of sheets and rods as used in motor car construction. The report was read by Division Chairman T. V. Buckwalter. According to it, the division's work divides itself into two parts. First, the presentation of specifications for sheet metals and rods, and, second, the submission of specifications for the dimensions of these materials. In order to arrive at what sizes for these to recommend, it is first necessary for the committee to know the preferred sizes as now employed by the manufacturers. Nearly every maker has his own special sizes, and at present there is no uniformity whatever.

For the purpose of ascertaining these particulars data sheets have been circulated to every maker asking that he note thereon his preferences as to sheets and rods. It is hoped that the returns on these requested data will be complete enough so that a number of definite recommendations may be submitted at next summer's meeting.

The composition of the manganese bronze as submitted follows:

Copper	56 to 60 per cent.	Lead impurities—	
Tin	0.50 to 1.50 per cent.	not to exceed	0.25 per cent.
Iron	0.50 to 1.50 per cent.	Zinc	Remainder
Manganese	0 to 0.75 per cent.		

This applies to manganese bronze in cold rolled sheets and rods and not to cast alloy. Manganese bronze is one of the strongest of the non-ferrous alloys, having a tensile strength of from 70,000 to 72,000 pounds per square inch. In thus submitting a

specification for this alloy, the report states that the committee endeavored to tie it down to chemical combination only, rather than to include both chemical and physical considerations.

The report was accepted by the society as one of progress.

Report of Broaches Division

The third report of the broaches division was read by its chairman, C. W. Spicer. The report was short and was characterized as essentially one of progress. There was no discussion, no points being brought out which had not been touched upon in the general meeting of the standards committee on the day previous. There was no new data presented for consideration. The manufacture of broaches and splined shafts is still in its development stage and there is an increasing tendency toward the hobbing of splined shafts. The depth to which straight parallel sides can be cut by this hobbing method for six splined shafts seems limited and this may necessitate the changing of the tables relating to this work which have already been accepted by the society. It may be necessary to modify the form of the splines or to supersede the present tables by some dealing with a greater number of splines of a shallower cut. The depth is some function of the number of splines and the diameter of the shaft. The time during which the committee has been considering this point has been too limited to arrive at any definite conclusions as yet. The dimensions which have been adopted for squares and tapers seem to be meeting with approval by the manufacturers, Mr. Spicer said. The report was accepted as one of progress.

Nomenclature Division

The nomenclature division, of which E. J. Stoddard is chairman, has been in operation only a short time and hence has had very little opportunity to do other than make tentative plans for its line of procedure. Mr. Stoddard merely gave his views as to what was contemplated in an informal way, he having no specific report to submit at this time. The field of such a committee is great, he said, and there is much to be done. In each factory there are many words which grow up from the shops and which are not correct when applied to any particular part of the car. They are not generally received and are perhaps not understood by those in other shops.

Mr. Stoddard suggested a dictionary of terms used in the automobile business to be printed in several languages for distribution and adoption in all countries, so that the present confusion would be alleviated. For instance, there is a difference of opinion as to the correct term to apply to the transmission gears. Should they be known as the gearset or the transmission?

In fixing terms for the various components of the motor car, Mr. Stoddard pointed out that the words used should be of general application and not one which is merely satisfactory to any one small body of men or to any particular art. That is, when naming parts the society should not only be governed by its own members for the correct term, but should fix a word which is satisfactory as well to any other body of engineers when used by them.

Mr. Stoddard asked for the support of the society at large and hoped that he could be of service.

In discussing Mr. Stoddard's remarks, Howard Coffin pointed out the great advantage to the service departments if the public called parts by their proper names in ordering, so that their wants could be filled promptly and so that it would eliminate the present necessity in many cases of further correspondence to determine just what part the customer referred to. This would be a saving both to owner and manufacturer. The United States Patent Office has also asked for the assistance of the society in arriving at correct and definite names for parts of the automobile, many of which at present are referred to by several different words. Mr. Coffin suggested an illustrated dictionary, published in six languages.

No official action was taken on the report.

Miscellaneous Division

Chairman A. L. Riker's report of the proceedings of the Miscellaneous Division featured the modification of the table of magneto dimensions accepted at the 1912 annual meeting of the society so as to read as follows:

Four and Six Cylinder Magnetos

	MM	Inches
Shaft height	45	1.771
Distance from center 2 front base-plate holes to large end of shaft taper	53	2.086
Distance from center front base-plate holes to rear base-plate holes	50	1.968
Distance from centers of base-plate holes left to right	50	1.968
Large diameter	15	.590
Small diameter	12	.472
Length of taper	15	.590
Taper 1:5 (included angle) 11° 30′ approx.		
Woodruff key No. 3.		
Height of magneto space	203	8.000
Length of magneto space	254	10.000
Width of magneto space	127	5.000
Plain hole timing lever	6.35	.25
Tapped hole timing lever ¼ inch, 28 P. S.A.E.		
Base-plate holes, ⅜ inch 16 P. U.S.F.		
Thread for end of magneto shaft ⅜ inch, 16 pitch, U.S.F., length of thread .5905.		
Advance lever radius 2.125 inches.		

The first nine items of this table remain unchanged from the former table, while those referring to the heights, widths and lengths of magneto spaces have been combined so that there is only one size of space regardless of whether the design is for the accommodation of a four- or a six-cylinder magneto. The specification for base plate holes has been changed to 3-8 inch, 16 p., U.S.F. as here noted. The only added points are for the thread for the end of the magneto shaft and for the advance lever radius.

In the report the S.A.E. standard yoke and rod ends were taken up and it was recommended that certain plain yoke ends be added to the list standardized. That is, ends which are plain as differentiated from ball and socket types. It was further

Informal committee which discussed relative merits of single and double wiring systems for electric lights

recommended that the specifications for the tensile strength and elastic limit of the standard screw thread material as previously fixed upon be stricken from the standards for the reason that the society should not dictate as to the quality of materials used but rather should confine its specifications as to dimensions.

In the short discussion of the paper which followed, Howard Marmon explained that the new recommended standard end is similar to the present adjustable end which has an extremely long clevice, except that it has a shorter end for use where such a long clevice is not required for adjustment.

The question of the practicability of the S.A.E. standard screw threads was brought up for discussion by the president. There seems to be some difficulty in using these standards for small sizes, some makers having to go back to the U. S. standards in these sizes. J. O. Heinze stated that in the plant with which he is coinnected the U. S. standards are used in cast iron and aluminum work while the S.A.E. threads are used for nut ends and the like. Mr. Marmon expressed substantially the same opinion on this point. It developed that in its fixing of these thread standards the division has already recognized that the S.A.E. threads are impractical for cast iron and aluminum.

Mr. Riker, in speaking of the striking out of the physical specifications for elastic limit and tensile strength, stated that there has been considerable feeling among the manufacturers of screws that this should be omitted for the reason that these working to the S.A.E. standards in other respects did not want to pay the additional price made necessary by this demand for such high-class material. It is the opinion of these screw makers that the physical properties of the material should be left to each engineer. The miscellaneous division's report was accepted as read.

Electric Lighting Committee

Alexander Churchward, chairman of the committee on electric lighting and its allied features, read a report which primarily recommended a very open discussion in the meeting of the subject of single and double wiring systems so that the views of the engineers could be incorporated in the later recommendations of the committee. These two systems differ in that the single wire system makes use of a ground for the return circuit, while the two-wire type uses a metallic return.

It was recommended that electric light bulbs be standardized and known as 7-volt lamps. These are to have an efficiency of 1.1 watts per candle at voltages ranging at from 6.5 to 7 volts. The size for headlights was standardized for the 2 1-16 inch size and capable of being focused in a reflector of 7 1-8 inches focal length or greater. Diameter of side and rear lights are fixed at 1 inch. Battery makers are to be circularized with the view of arriving at two standard overall heights and widths of storage batteries for automobiles so as to give three standard plate sizes from which batteries of any capacity can be made by simply increasing the overall battery length. Lighting system manufacturers are also to be circularized to fix standards for fuses and dimensions for boxes. The report also touched upon the consideration of dimmers for headlights as suggested by legislation now in force or under consideration.

The discussion on the subject of two-wire versus single wire installations indicated that the manufacturers or motor cars and also the makers of electrical apparatus will welcome the system of single wiring if it can be conclusively shown that its use is advantageous and not attendant with power loss and difficulty of maintaining proper grounds.

A. L. Riker stated that the electric lighting of automobiles is today in the same position as that occupied by the electric lighting industry in general 25 years ago. We should be able to adopt something as standard which will live and to profit by the experiences of the older and allied lighting industry. The single wire system eliminates many of the present troubles, he said. Its difficulties of good ground return are more theoretical than actual. In favoring the single wire system Riker further added that if it is possible to eliminate some of the elements and fixtures now called for with the present double wire systems, the modern automobile would look less like an electrical supply store and more like a real machine. The matter should be given deep consideration and not discarded without fair trial.

A. L. McMurtry stated that he has come to the conclusion that the single wire arrangement is undoubtedly the simpler especially in locating trouble. There is only one wire from the switch and only one to each of the lamps. In case of a short circuit there is only one wire to disconnect, while with the two-wire system there are two to be considered unless it so happens that the right one is struck the first time. With a first-class grounded system, there is less loss than in the poorly wired two-wire system grounded directly to the frame, said McMurtry.

R. H. Manson gave it as his opinion that any changing in systems should be done immediately rather than in the future, looking at the matter from the standpoint of the manufacturer. The single wire system requires a bulb with a different base than that of the two-wire system lamp, so that the present lamp with which supply stores everywhere are stocked would be of no use, and it would take some time to affect the change in the dealers' stocks. In advocating the single wire system, he cited the telephone circuit as an instance of a grounded system working satisfactorily even though complicated.

Howard Coffin stated that he saw no reason for the retention of the present wiring if the other will work equally as well. Mr. McMurtry stated that half the troubles with lamps today is due to the delicate connections made necessary with bulbs for the two-wire outfits. This becomes especially frail in the smaller sizes of lamps. The single wire system would make use of very much simpler bases and sockets—the constructions would be much more substantial. Mr. Churchward brought out another point when he said that in the case of grounds, the single wire system is bound to blow out something immediately the ground defect is made, while with the present system in the case of a ground, there is only a slight leak which is not immediately noticeable and which will gradually sulphate a battery and thus drain it almost unnoticeably.

J. O. Heinze was practically the only engineer who was somewhat opposed to the new system, stating that in the great office building for instance we would not think of using one side of the building for a ground return. The two-wire arrangement he said gives twice the reliability.

E. T. Birdsall cited the example of the steel battleships which ground all their electric lighting circuits on the steel hulls. Mr. Manson advanced the counter argument that in the steel building there are so many different kinds of circuits that insulating them is necessary. Such installations are not analagous to the much simpler car wiring systems, he said.

In closing the discussion, Mr. Churchward stated also that the steel building illustration does not apply to automobile electric practice. All circuits in such cases are fed from the same mains, while in the car there are separate circuits for each unit.

The report was finally adopted as read.

Rim Standardization Action

Action was taken regarding the present situation caused by the internal dissension within the rim association. This matter was discussed in connection with the meeting of the standards committee as reported last week. There is a likelihood that the rim association will soon be disrupted with the result that the market will be flooded with many types of demountable and detachable rims. There are at present about five types of demountables and as many detachables. With this situation in view it is now high time for the society to step in and seek to standardize this part of the industry so that there will be one standard type of each class of rim—including the straight-side type.

Accordingly, the following resolutions were adopted by the society at the meeting of January 17:

RESOLVED, That, there are too many pneumatic tire rims in the market;

That this society believes that a much smaller number of rims

will satisfy the needs of the industry and at the same time will bring about a great saving;

That the committee appointed to consider and report upon this subject shall proceed at once to hold such meetings and hearings as will bring about an improvement in this situation;

That a report be submitted at the earliest possible moment;

That this committee shall co-operate with the National Association of Automobile Manufacturers and with the Automobile Board of Trade.

The committee to consider an improvement in the rim situation for pneumatic tires was appointed and has as members representatives from the several industries involved. The membership of the committee is as follows:

H. L. Barton of the General Motors Company, Detroit, Mich.
G. G. Behn of the Hudson Motor Car Company, Detroit, Mich.
C. E. Reddig of the Timken Detroit Axle Company, Detroit, Mich.
C. D. Williams of the Mott Wheel Works, Utica, New York.
J. J. Vincent, Packard Motor Car Company, Detroit, Mich.
C. B. Whittelsey of the United States Rubber Company, Hartford, Conn.
H. E. State of the Goodyear Rubber Company, Akron, Ohio.
Henry Souther, Consulting Engineer Standard Roller Bearing Company, Philadelphia, Pa.

A meeting of the committee was held and it was decided to hold a meeting in Cleveland, O., at the earliest possible moment.

At that meeting the final organization of the committee will be accomplished. Following this meeting a hearing will be given to all those interested in the situation, that is, to those having rims which they would like to have adopted as recommended by the society.

Those appearing at the hearing will be requested to produce the metal parts of a rim complete as furnished, including felloe band and all attachments.

The weight of these parts will be carefully scrutinized and will form an important consideration in the choice of any rim. No specially prepared or machined exhibits will be considered. The rims and parts must be exactly as furnished commercially.

A complete wheel with tire must also be furnished for demonstration purpose.

The standard size of all exhibits will be 36 by 4.5 inches.

Tools for attaching and detaching and means for inflation must also accompany the exhibit.

From the Maker's Standpoint

E. R. Hall discussed the situation from the standpoint of the tire manufacturer, stating that all such concerns would welcome a standard rim of low cost and easy operation which would not work a hardship upon the manufacturers as far as cost was concerned. H. B. Bannister, a wheel manufacturer, stated that both the wire and the wood wheel makers would welcome the society efforts along this line. S. W. Alden pointed out that the committee would give a full hearing to all concerned since it is made up of men whose activities cover every branch of the trade. F. A. Bower gave it as his opinion that the action was a most excellent thing on account of the greater economy which it would work for all manufacturers. H. L. Pope said that the move is the proper one. There should be a single rim and the committee is capable of adopting one. This may not be the best possible, but it will be the one which the committee finds to be best adapted to all classes of work as far as it can determine at this time. In any case the right one will be settled upon eventually as a result of the committee's deliberations.

Mr. Souther took up the intended action at the Cleveland meeting in details and stated that no favorites will be played. The object is to arrive at a standard type which will work for the greatest good of the greatest number. Any arrangement which this committee makes will include competition, he said. The action of the committee was approved by the society.

J. C. Heinze, in his report on motor testing methods, outlined by charts the various testing apparatus used by him at the Northway motor plant, and as chairman of the committee recommended that the society should collect data on how motor testing is done at the different factories. The first sheet exhibited was that of a standard form for recording results of motor tests. It should, according to Mr. Heinze, contain the following information: 1—Name of company; 2—Name of report; 3—What test consists of; 4—Date; 5—Where report is recorded in the office bulletin; 6—Such facts as specific gravity of gasoline, temperature of gasoline, temperature of room, temperature of water, barometric reading, and relative humidity; 7—Model number of motor, and motor features; 8—Kind of dynamometer used; 9—Name of carbureter and type, name of magneto and type, name of sparkplugs and type; 10—Weight of motor, weight of pistons and connecting rods, amount of cylinder offset from center line of crankshaft; 11—Name of engineer making test; name of assistant engineer; 12—Space for standard curve on regulation section paper (the vertical should indicate horsepower from 1 to 100, and the horizontal crankshaft revolutions from 2,000 to 3,000, and piston speeds in feet per minute; this should also show the horsepower output per cubic inch of piston displacement, and if a 63-inch beam, or shorter was used); 13—This particular chart shows six curves: A—Curve of motor; B—Torque curve at different speeds; C—Air consumption in cubic feet per minute, without carbureter; D—Air consumption in cubic feet per minute with carbureter; E—Gasoline consumption in pounds per hour, and F—Gasoline consumption in pounds per minute per horsepower, or per horsepower-hour.

Plotting the Air Curve

It is necessary to plot the motor's air curve when a carbureter is not attached in order to get accurate volumetric efficiency. By doing this you can also show the losses due to the carbureter, which often amount to 10 per cent., and which fact is an important one for consideration when selecting the different carbureters to be used.

Accurate record of gasoline consumption is taken in order that the efficiency of different carbureters can be gauged, and it is impossible to get this without plotting the air curve. Taking the air curve also enables one to obtain the mechanical losses in the engine, due to connecting rods, pistons, etc. By plotting the mechanical losses in the same motor, with off-set cylinders, and then with the cylinder centers in line with the center of the crankshaft, you are enabled to obtain the best percentage of offset.

The air consumption curve also aids in the design of the camshaft as it shows one when one has the maximum volumetric efficiency. To readily determine this a long sliding cam is used which is practically V-shaped at one end, and nearly rectangular at the other, and with every gradation between these extremes intermediate of the ends. By sliding this cam it is possible to get the design that will give the maximum volumetric efficiency. The type of cam selected depends upon what the manufacturer desires by way of a motor. If the design is for a touring car, one type of cam will be used, but if for a racing machine another type can be used.

The various testing apparatus used by Mr. Heinze, and reproduced on charts, will be published in a later issue of THE AUTOMOBILE. They consist of an air meter placed in series with the carbureter; water tank arrangements for measuring heat losses through the jackets; radiator testing apparatus; apparatus to show period of ignition instead of depending upon magneto breaker box; device for measuring the temperature of the spark; apparatus for measuring carbureter acceleration; apparatus for measuring motor vibration between different ranges of speeds; electrical device for measuring waves in primary and secondary transformers; and other apparatus for measuring cylinder compression.

Christian Girl in presenting the report of the spring division which was to have been submitted at the June session, stated that the work of his committee was rather to simplify the spring situation, so far as the manufacturer was concerned, than to standardize parts. The report was accepted as a progressed one. The committee has before it the collection of information on the best length of spring pads or seats for overslung and underslung springs, and also the accepted distances fore and aft between spring clips, for springs of different lengths.

T. V. Buckwalter in presenting the report on aluminum and copper alloys recommended an alloy for general utility of:

Copper	87 to 89 per cent.
Tin	9.5 to 10.5 per cent.
Zinc	1.5 to 2.5 per cent.

In the United States standards the divisions are: Copper, 88 per cent.; tin, 10 per cent.; and zinc, 2 per cent. The recommended specifications give an alloy with reasonable working limitations, and with a tensile strength of 35,000 pounds.

The copper alloy recommended for gears, worms, etc., is:

Copper	88 to 89 per cent.
Tin	11 to 12 per cent.
Phosphorus	.15 to .30 per cent.

and can be manufactured by any good metallurgist. The report was accepted.

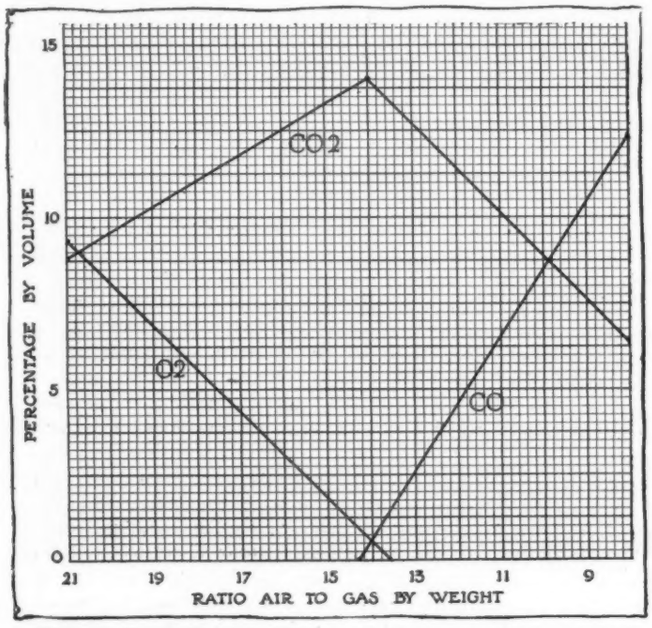
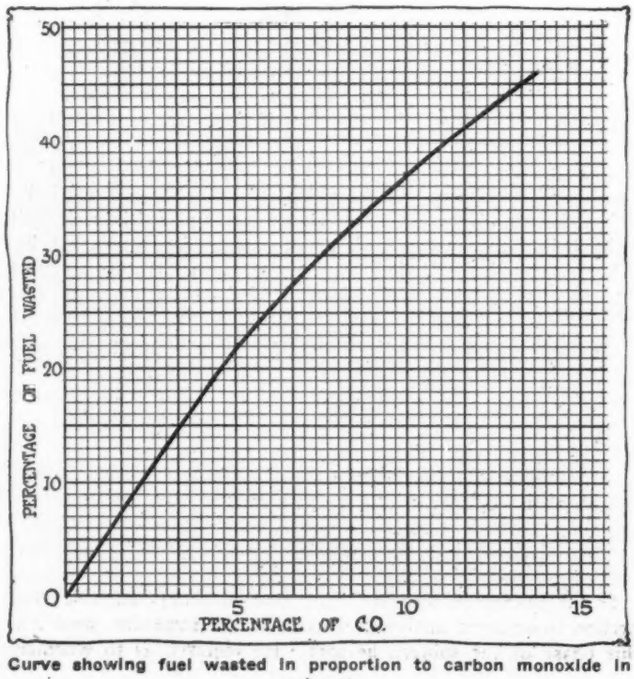


Diagram for determining the approximate proportion of air to gas when direct measurements of the quantity of both cannot conveniently be taken



Curve showing fuel wasted in proportion to carbon monoxide in exhaust

Exhaust Gas Analysis

Measurement of Air and Gasoline Makes It Possible to Determine Whether Proportion of Each Remains Constant

S. A. E. Convention

THE topic of exhaust gas analysis discussed during the Friday afternoon session was one of the best attended and most interesting of the week. A number of authorities on the subject were on hand to expound their ideas and experience which in several instances has extended over a long period of years. Dr. Arthur H. Elliott was scheduled to present a paper on the analysis of exhaust gases but owing to illness was both unable to prepare any material and also to be present to aid in the discussion.

The analysis of the exhaust gas of an automobile motor is becoming to be looked upon as necessary to the proper determination of the efficiency of the engine under test by many engineers of long experience in testing work. By means of data as to constituents of the waste gases the engineer is able to determine whether or not the motor is getting all of the useful energy and power out of the mixture.

In the absence of Dr. Elliott several notes on the subject were hastily prepared by Herbert Chase, laboratory engineer of the Automobile Club of America, who dealt with the subject in its relation to carbureter and engine testing. Mr. Chase said:

"Some of you will doubtless recall that I gave you in the paper which I read before the society at its last summer meeting some data which I had obtained along this line in testing a six-cylinder Pierce motor. Since that time I have conducted a considerable number of tests in which samples of the exhaust gas were taken and analyzed. I am now convinced that I was correct in the impression stated in this paper that a much more satisfactory method of taking the samples of exhaust gas could be employed than the one there outlined. We now use a method which gives much more consistent and satisfactory results for reasons which I will shortly point out.

"It has been our practice to make tests along very much the same lines as indicated by Mr. Heinze in his discussion of motor testing, although the methods which we employ differ somewhat in detail. In addition to measuring the air and the gasoline which enter the motor, we also analyzed samples of the exhaust gas for the following reasons:

"Measurement of the air and the gasoline makes it possible to determine whether or not the proportion of each remains constant. Aside from this, one very important factor remains to be determined, namely, Is the gasoline properly mixed with the air in such manner that each molecule of oxygen and hydrogen will come into contact with a molecule of oxygen during the very short period of time when effective combustion takes place? It may be argued that this question will be answered by measuring the horsepower at the same time that the air and gasoline are measured and concluding that a better diffusion of the gasoline in the air is obtained, when, as a result of some change in the method of spraying without changing the proportion of air to gas the power increases. This process can be followed with reasonable satisfaction up to a certain point, but when is the investigator to know whether or not still better results could be obtained until he has determined the completeness of combustion?

"There are other arguments in favor of analyzing the exhaust gases. One is the convenience and simplicity of the determination but means for measuring the air are not at hand. In road testing it is quite easy to make samples of exhaust gas for later analysis, whereas air measurements would be exceedingly difficult, if not impossible.

Prominent Engineers Discuss Exhaust Gas Analysis
Howard Coffin W. C. Marshall A. L. Riker

"Professor Watson, an English investigator of considerable prominence, has obtained the curves given herewith. These provide a means of determining what the approximate proportion of air to gas is when direct measurements of the quantity of both cannot be conveniently taken. They, of course, apply only when the combustion is complete, in so far as it can be complete with the quantity of oxygen present.

"With the price of fuel rapidly increasing it now becomes more important than ever to get the greatest possible amount of power out of the given amount of fuel. I am very decidedly of the opinion that this object could be obtained more readily if engineers would give more consideration to exhaust gas analysis.

"Chart two is also taken from one of Professor Watson's papers. It shows the per cent of fuel wasted with the given per cent of carbon monoxide in the exhaust. I may say also that Professor Watson has found in some of his investigations that the maximum power of a motor is obtained with a ratio of air to gas from 12 to 1 to 13 to 1 by weight. He has determined that the maximum thermal efficiency corresponds to about 17 parts of air to 1 of gasoline. Other investigators state that about 14 parts of air to 1 of gas, which is approximately the theoretical amount necessary for complete combustion, gives the best thermal efficiency."

The discussion of the subject was opened by E. R. Hewitt who has had wide and varied experience along this line. He outlined the apparatus which he uses in making exhaust gas analysis tests on the road and explained the method of attachment to the car. The necessity for rapid collection of the sample of gas to be tested was emphasized. It was also brought out that results obtained by road tests are not the same as those under brake test conditions. The reasons which Mr. Hewitt gave for this difference are that the jar of the motor on the road affects the carbureter float level and also the variation in temperature under the hood has a bearing on the results obtained. He stated that there was a difference of 15 per cent. to 100 degrees Fahrenheit variation in temperature. For greatest efficiency on the brake as well as on the road Mr. Hewitt has determined the following exhaust analysis:

13.5 per cent..... CO_2
0.1 per cent..... O
0.2 to 0.3 per cent..... CO

Whenever an analysis of the exhaust gases does not check up as would be naturally expected, the deviation from the normal conditions may be ascribed to poor carburetion. The normal analysis would show intimate mixture and complete combustion.

Mr. Hewitt touched upon tendencies for condensation within the manifold. With any carbureter whatever with velocities in this carbureter below 5,000 feet per minute, it is impossible to get away from condensation within the manifold. We get best results at 15,000 feet per minute.

Mr. Hewitt has determined that the maximum efficiency mixture has approximately the following composition:

12.5 per cent..... CO_2
2.0 per cent..... O
0.0 per cent..... O

Mr. Hewitt has made a number of tests with the view of determning the effect of the action in the intake both on the power developed and on the mixture and has found that 1 inch mercury suction defects the power about 10 per cent., which relation holds up to 3 inches of mercury, so that if it were possible to reduce the suction to zero, we would get an increase in power of about 30 per cent.

J. M. Breitenbach gave his opinion that another reason for power loss in motors designed according to American practice is that the explosion chambers are too large and that another is on account of incorrect timing.

Prof. W. C. Marshall, Sheffield Scientific School, Yale University, added some most interesting points to the information already given out, his ideas coming as a result of a number of road tests made under varying conditions of speed and with different types of motors, during the past summer. In his experience he has found that under road conditions the analysis compare very closely with those given by Mr. Hewitt. He pointed out that from the amount of CO_2 which is present in the waste gases is a very correct indication of the fuel consumption of the motor. For instance when from 5 to 6 per cent CO_2 is found, the car averages from 4 to 5 miles on a gallon of fuel, while when the exhaust shows 12 to 13 per cent. CO_2 the economy runs up to three or four times as much.

Looking at the practical side of the problem Professor Marshall stated that an exhaust gas analyses as applicable to automobile engineering are not so difficult as to cause any engineering department to hesitate to make them. Determination of the composition of the waste gases not only affords a means of gauging the economy of the motor but also makes it possible to arrive at the relative efficiency of the carbureter.

Mr. Hewitt in reply to a question as to what engines he used for his tests stated that he had employed two machines for the purpose, one a four- and the other a six-cylinder model. The cylinder dimensions of these two motors are the same, being 4 by 4.75 inches. He averages from 21 to 24 miles per gallon with the four-cylinder type and 14.5 to 15 miles per gallon with the six.

W. G. Wall, chief engineer of the National company stated that he has made a number of exhaust analysis tests during the last 2 years, and that due to the many variables such as the size of the intake, the shape of the ports and so on, he has come to

Leaders in Exhaust Gas Analysis Discussion
Herbert Chase Edward R. Hewitt

the conclusion that gas analyses are of very little value. When very best theoretical results are obtained they are of little use from the practical side. He has been unable to arrive at any definite conclusions by this method of motor testing due to the many contradictory results.

E. J. Stoddard touched upon the chemical manipulation in connection to accurate analyses. Engineers are somewhat weak on this phase of the subject, he said. He inquired as to whether

the absorption of oxygen is liable to produce CO in itself. The reply was negative.

Mr. Hewitt was requested to outline briefly his method of procedure in making exhaust analyses. The CO_2 is absorbed first after which the oxygen is removed which leaves only the CO. In discussing carbureters in this connection he stated that he has tested in all about thirty types, and that the analysis does not depend upon this feature. One carbureter will work well at one particular range of speed and may be very poor at a lower or higher range. There is no carbureter at present which works equally well at all speeds. In the average case the carbureter is adjusted for too rich a mixture at all times. This is due to the fact that it is impossible to compensate for differences in temperature under the bonnet so that if an instrument is adjusted for best running at a good speed, it is very poor for starting purposes. Dash carbureter adjustment for manually changing the mixture in accordance with these varying conditions is therefore necessary.

T. S. Kemble believes that horsepower and other block tests are equally as good for arriving at the efficiency of motors and for deductions as are an analysis of the exhaust.

In closing the discussion Mr. Chase mentioned the point of dissociation and recombination which has been brought up earlier as a possible theory as to the action of the gases in burning. He stated that the society would be authoritatively informed on this point later. The great amount of trouble which some have with analyses may be ascribed to the methods of collecting the samples. It is important to get these samples without admitting any outside air and also to attain them under average conditions.

Closely allied with the discussion on the analyses of the burnt gases in the automobile motor, was the paper presented by G. T. Briggs and prepared by C. P. Grimes on the subject of motor testing. The paper follows:

This paper presents in a general way points which have been observed through the aid of our testing laboratory to be most influential in attaining a perfected power unit. The nature of our work is such that we seldom have time to enter into a detailed analysis of any one motor, but by careful observance and record of the general performance of each motor that passes through our dynamometer test, we are able to give what we believe to be a comprehensive idea of the predominating features that produce results.

The general running balance of a motor, though generally conceded to be a matter of design and manufacture, has been found to be affected greatly by carburetion. A case in point was a long-stroke L-head motor of standard make equipped with a stock carbureter. At 22 miles per hour the motor would vibrate so violently as to shake the whole car. By changing to a different type of carbureter the point of vibration was eliminated almost entirely and could be detected but slightly at a speed of 32 miles per hour.

The requirements of ignition are in general very well known. We have found, however, that a material percentage of ignition trouble can be traced to a lack of symmetry in timing. Our special instrument for the purpose has often shown one of the sparks to pass out of synchronism with the others as much as 5

Snapshot of Gas Analysis Controversy

H. L. Pope Coker F. Clarkson W. G. Wall L. B. Brown

Engineers Discuss Dynamometer Testing

R. W. Funk A. L. McMurtry D. Beecroft G. T. Briggs

degree which would be quite noticeable under idling conditions and be indicated on a dynamometer test. Motors with a set spark will not show the best range of action in power or throttling. We have found it impossible to put as much snap or getaway into motors that are equipped with an automatic spark advance as into those with mechanical advance. Further, the rate of flame propagation in a gaseous mixture, other things being equal, is near its maximum at a 12-to-1 ration. The rate decreases with departure from this value in either direction, so that at any given speed there are a number of different best settings for the spark advance.

The number of cases brought to our attention have assured us that carburetion has far more to do with ignition than is generally recognized; depending upon how well the carbureter can be made to do its work of producing a homogeneous gas.

The question of manifolds is one of not alone great source of error, but is often a very delicate subject, especially in the case of a pet design. Experience gained from building a number of different designs leads me to say that in the final analysis the problem is purely and simply a matter of aerodynamics, not to be guessed at. The mixture traveling in the intake manifold may be likened to perfect dry steam or when filled with particles of liquid, wet steam. The designer of a manifold should bear in mind that steam separators are built with rough surfaces and sharp turns in order to accomplish separation. The function of the manifold is to distribute the mixture in exactly the same proportion as received from the carbureter without separation and with the minimum loss of head by friction.

Any device to improve the condition of the gas should be welcomed, such as a heat jacket or passing the gas through cored passages in the cylinder block casting. Before adding the best device the ultimate result on the power of the motor should be considered. If the jacket involves no increase in suction in the manifold, 2 per cent. in volumetric efficiency and power will be lost for each rise in temperature of 10 degrees, Fahrenheit, of the gas. If the heat device causes added suction in the manifold, about 4 per cent. in volumetric efficiency and power will be lost for each inch of mercury that the suction may have been increased. These statements may appeal to you as explaining increased power of a car on a cool evening and the decrease of power with ascent into a higher altitude.

If designers gave a little more consideration to the fact that the gases traveling in the manifold weigh about three times as much as air and move at the rate of from 300 to 400 feet per second with considerable momentum, I believe we would see far more consistent results, and that much of the uneven running due to oscillatory surges could be avoided.

The most effective manifold is not always the shortest that can be built. But of two things I feel positive, namely, that a long vertical lift of the carburetted gases is not only unnecessary but vicious practice that does rank injustice to both the motor and the carbureter. Furthermore, smooth streamline passages should always be adapted in manifold construction. The lack of these requisites has often been the means of discounting an otherwise well-designed motor.

As an aid to investigation I suggest that in the event of a newly designed motor running unevenly, the exhaust manifold be removed, giving each cylinder an equal chance to scavenge. The color of the flame from the ports may be taken as a criterion of the distribution from the inlet manifold. It is not uncommon to find that the injector action of the gases will tend to scavenge some cylinders and foul others.

Carburetion is a subject upon which very few have definite and reliable information. Before a new model carbureter is adopted,

we test it in our dynamometer room to determine torque, horsepower, economy, volumetric efficiency and richness of mixture at every speed. By a specially designed instrument records of revolutions passed through, gasoline consumed and air consumed are made electrically, a split-second timepiece without any chance for human error to enter being used.

A thorough road test is then made, after which the whole car is placed in a refrigerating plant and the temperature reduced to 5 degrees, Fahrenheit, above zero, so that we may study the conditions of starting, running and power delivered at the wheels in winter.

We feel prompted to make the assertion that the American public will not accept a carbureter that gives a uniform mixture under all conditions, but demands a quick getaway, economical running and a powerful mixture at maximum speed.

I submit herewith some data taken from a test made in our laboratory on a four-cylinder block motor 3 3-16 inches by 5 inches, of the water-cooled poppet-valve type.

R.P.M.	Lbs. at 36"	H.P.	R.P.M.	Lbs. at 36"	H.P.
600	48.7	16.70	1400	49.6	39.75
800	53.0	24.22	1600	48.0	43.95
1000	54.7	31.25	1800	46.6	48.30
1200	52.5	35.95	2000	44.9	51.20

Exhaust valve diameter = 1.875". Inlet = 1.8125". Lift = 0.3125".

The valves, eight in number, were placed in a row on the top of the block casting.

The secret of the whole performance may be found, we believe, in the fact that the designer of this motor recognized the laws of aerodynamics and handled the gases accordingly.

Before closing, we wish to state that consumption of fuel is, to a very great extent, a personal equation, to be solved by each individual motorist. Our records show that the best economy per brake-horsepower-hour was obtained with a 14-to-1 air ratio and that with this setting no *CO* could be detected in the exhaust. We admit that this ratio would not please those who are always in a hurry to get started or delight in darting around slower vehicles, but for each percentage of *CO* permitted in the exhaust, from an overly rich or snappy mixture, a net loss in fuel of 4 per cent. will be suffered. I wish to add that the majority of cars delivered to owners by salesmen and testers emit as high as 10 per cent. of *CO*, which represents a waste of nearly 40 per cent. of the fuel fed to the motor.

Mr. Hewitt was again requested to open the discussion, bringing up the point of smooth versus rough inlet passages. His tests favor the rough cast metal type so that the fuel may be broken up by the surface with which it comes in contact. Although advocating rough passages, he pointed out that the corner should not be so sharp as to offer resistance to the flow of the gas. He was asked if the rough surface would not materially tend to cause condensation on the rough edges and replied that he has always jacketed these inner passages and hence has had no such trouble.

Mr. Chase held that proper ignition is important to get best results. In comparing two carbureters it is necessary to insure constant ignition which is equally as efficient when one carbureter is used as when the other is under test. It is unfair to make comparisons relatively when these conditions are not the same. Comprehensive tests should also take into consideration atmospheric conditions such as a barometer pressure, humidity and so on. Touching upon manifold construction, he advocated the use of the straight type with branches to the cylinders.

J. O. Heinze discussed the point of manifold construction and stated that if possible the intake pipe should vary in length in proportion to the speed of the engine. Inasmuch as this is impossible the length used should be the best possible medium between the very long and the very short, so as to efficiently take care of the greatest range of speed. To bear out this assertion he outlined a number of tests which he has made with glass tubes in which the action of the mixture in combining could be witnessed. In order to mix the air and gasoline a certain constant time is necessary, hence, the greater the engine speed the longer should be the passage for the gas so that it may have sufficient time for combination.

Prof. F. R. Hutton made an appeal for greater definiteness for the term carburetion in view of the present tendency toward the use of heavier fuels such as kerosene which when combined with air to make an explosive mixture cannot properly be classed as strictly carburetion. While the manifold has a very important function with gasoline, it is still more so with less volatile fuels, such as kerosene.

Speaking of Prof. Hutton's talk on the misuse of the word carburetion and his ideas of the applying of a term such as atomizer or vaporizer to the device which mixes kerosene with air, Howard Coffin was of the opinion that the engineers are interested more in the results obtained through the use of these newer mixing devices than they are in the nomenclature. Mr. Coffin spoke further of a number of tests which have been made at the Hudson factory which have led him to come to the conclusion that if it were possible to so construct the motor that at the end of the suction stroke after the cylinder had been filled with all the charge which would be taken through the carbureter, were possible to inject fresh air immediately over the top of the piston and in proper proportion the mixture would be entirely consumed. In these tests it was found that carbureter troubles were eliminated; the cylinder oil even being entirely burned so that there was no semblance of carbon. This burning with excess air if developed means the production of much greater power than now obtained from motors of given dimensions and would mean that bearings and other parts would have to be strengthened and redesigned for the greater forces exerted. It is now possible to get greater power out of a motor than present practice can take care of.

Mr. Hewitt stated his belief in this idea also although he pointed out that maximum practical compression pressures have been determined of from 72 to 78 pounds per square inch. In the average case 72 pounds per square inch is about the maximum which can be carried. Mr. Hewitt has found that ordinarily an engine will completely fill its explosion chambers with the combustible mixture up to 1,000 revolutions per minute but not above this speed.

F. S. Dusenberg stated that cam setting effects compression and that he has obtained in motors of his design as high compression at 1,500 as at 1,000 revolutions per minute.

Mr. Heinze outlined some experiments which he has made by heating of the intake passages. These experiments contemplated the winding of wire around the pipe and then passing a current through it thus obtaining a greater heat than could be obtained by hot water jacketing. He found no advantage of heating these manifold pipes although very beneficial results were obtained when the fuel in the bowl of the carbureter itself was heated. Large increase in power was thus obtained.

Road and Dynamometer Testing

At Friday afternoon's session a discussion of the relation of road testing to dynamometer testing brought forth some good points. According to E. R. Hewitt, both are essential. Herbert Chase advocated more accurate road tests than those now performed. Much can be gained from such determinations, he said. These tests should be standardized just as much as should those relating to the laboratory or block. It is exceedingly difficult at present to compare results of tests by different persons as apparatus used, methods, and data are widely at variance. An instrument is needed for accurately obtaining horsepower and torque readings on the road, said Chase. H. L. Pope suggested that the motor testing division of the Standards Committee have its scope broaden so as to include road tests in its standardization work.

Prof. W. C. Marshall said that road tests are neglected by many manufacturers. Just as valuable information and the same information may be obtained on road tests provided an accelerometer is carried. To prove this as certain Prof. Marshall showed torque curves could be plotted from readings taken from such an instrument. Torque curves thus obtained are more valuable than the laboratory kind, in that they are taken under real road conditions.

Although there were some who were not in favor with the road tests and could not see their advantage the majority of those present are awake to the advantages to such methods of obtaining data.

Ignition, Motors and Gearsets Discussed

S. A. E. Members Argue Pro and Con on Six-Cylinder Motors, Rear Axle Gearsets and Electric Starting Systems

WILL the magneto as at present fitted be discarded owing to the adoption in some quarters of the cranking motor, lighting plant and ignition being contained in one unit?

A. L. McMurtry opened the discussion on the subject by stating that the high-tension magneto as at present used was a most reliable instrument. When the question of a combined system of starting, lighting and ignition system was considered, the element of security was not so great as with the present magneto, as it only requires a short circuit anywhere in the various leads, to render the ignition system useless.

Question of Weight and Cost

A. L. Riker thought that it was a question to determine whether the same result could be obtained with the one unit as well as with the three unit? Further, if the result were the same, what the relation would be in point of view of first cost? He thought that a combined unit would cost less, but the relative weights and space occupied were also points that would have to be considered.

Mr. Hartford agreed with Mr. McMurtry that it was better to continue to use the high-tension in addition to the other electrical equipment employed for starting and lighting.

Professor Hutton said that he had had some experience with this situation and had experimented with two batteries, but owing to the lack of standardization in wiring he was continually troubled with short circuits. Until the methods of wiring are improved, he thought that the present plan was the better. A possible solution was the motor and generator combined and the outcome of experiments along this line might be satisfactory. In the speaker's mind there was a doubt, and the question resolved itself as to whether it was desirable to attack the effectiveness of the motor in any way?

V. G. Apple believed that for commercial reasons that it was better to continue to use the magneto for ignition purposes. He advocated taking the current from the battery for starting purposes only.

Mr. McMurtry pointed out that the Bosch company has brought out a small magneto to be fitted on the dash for starting purposes, thereby doing away with the battery. He thought that there must have been a reason for this and went on to state that it simplified the system considerably as the batteries had other duties to perform.

H. L. Pope stated that it was best to leave the magneto alone for the present. He thought that the time would soon come, however, when the various systems would be combined. There would be a saving of weight and less initial expense also.

Howard Marmon stated that it has taken a number of years to develop the magneto to its present reliable state, and one advantage of the magneto is that as the speed of the motor increases the intensity of the spark increases also. This fact simplified control.

Mr. Alden said that no doubt it would be the survival of the fittest in the long run.

"Why has the 42-inch wheel been discarded?

Mr. Alden said that it was not so much a question of the 42-inch wheel being discarded as that it had failed to grow in favor and he called upon the several members present to give their opinions upon the matter.

Mr. Riker pointed out that the majority of Americans wanted to carry three people on the rear seat and to do this it was necessary to have an overall width of 57 to 58 inches. The public also wanted to be as near the ground as possible. With a 42-inch wheel, 57-inch tread and a body width of 57 inches the tendency of the larger wheel design was to perch people high up in the air. Then there was the question of the additional cost of the tires and he did not think that the advantages gained by the large wheels were in proportion with the extra cost entailed. To hang the body low and use large wheels is not feasible without increasing the tread and he did not think that this was a move in the right direction.

Mr. McMurty said that he had built a horseless carriage in 1897 to which he fitted large wheels and experienced considerable trouble from broken axles and broken steering spindles. The size of the wheels was originally 40 inches and upon reducing the size of the wheel to 30 inches the axle trouble disappeared.

Professor Hutton pointed out that the increased diameter of the wheels gave a longer lever arm to the body and that heavier brakes would be necessary. It was a question in his mind whether the better riding qualities was imaginary or not.

Mr. Alden stated that he had ridden in several cars with large diameter wheels and with smaller ones under the same conditions and he had experienced more comfort with the large wheels.

War of Fours and Sixes

"Will the six-cylinder motor eventually displace the four-cylinder for passenger cars?"

Several members expressed the opinion that the four-cylinder would remain the logical motor for automobiles the purchasers of which had to study economy either from the point of view of low cost of purchase as well as low operating costs; but for those who were willing to pay the price, the six-cylinder would prevail. Mr. McMurtry stated that while in Europe he had ridden many miles in several of the small four-cylinder cars which are invariably fitted with four-speed gearsets and provided one did not want to continually drive on high gear the efficiency of these little machines left nothing to be desired.

Professor Carpenter said that 12 years ago prophecies were made that the single-cylinder would be the ultimate type, and in some years to come they might find that any of the prognostications made at this date might equally fall short of the mark as those made in the last century. He thought that the four-cylinder would always be in demand. It met the requirements for the light vehicle and in this field he did not think that it would ever be displaced.

Mr. Alden said that he had a town car with a very small motor and a final gear reduction of 4.25 to 1 and that it was entirely satisfactory. While it only had three speeds it was only used for town work, but in the case where the type of car was used for country driving it was fitted with four speeds.

Mr. Pope remarked that one item to be considered was the manufacturing cost and also the question of weight. Despite the fact that some of the builders of small cars were fitting six-cylinder motors at present he thought that they would come back to the four-cylinder type.

Mr. Heinze said hat it was common knowledge that the thermal efficiency of the four-cylinder engine was superior to that of the six. By fitting a heavier flywheel to the four it was possible to make it run as smoothly as six, although this reduced the accelerating properties. Owing to the more constant torque the six accelerates better than the four. If the purchaser did not consider economy undoubtedly the six-cylinder was preferable. The advantages of the four-cylinder are power with economy and a minimum of weight.

Mr. Kemble stated that for a matter of economy the four is undoubtedly the better, but for those who want luxury the six is preferable. He thought that there would always be a demand for both four and six-cylinder motors.

Mr. Riker said the four is more economical to build and also to run. The reason why six cylinders have in many cases supplanted the four is due to the lesser vibration of the six. He noticed that customers who have ridden in fours and sixes express a preference for the six and when asked the reason cannot explain. He gave the matter some thought and stated that the reason came to him while he was making some bench tests. While a four-cylinder motor is running at from 1200 to 1300 r.p.m., the stand carrying the motor being bolted to the factory floor, it is almost impossible to keep the heels on the ground due to the vibration set up, but in testing a six-cylinder motor at the same engine speed he did not notice any inconvenience. The sensation experienced after driving continually behind a four-cylinder car for 200 miles at a stretch is one of fatigue, while after driving the same number of miles behind a six-cylinder motor he did not feel at all tired. He was of opinion that the absence of vibration in the six-cylinder motor is a determining factor. There is a tendency to decrease horsepower and he thought that this would bring with it a reversion to four-cylinder motors in some cases. Undoubtedly the six had come to stay. The public wants a six in the same manner that it wants electrical starters and will not take any other kind and it is just the same with the six-cylinder motor.

President Marmon Favors Both

Mr. Marmon thought that the word pleasure car was a misnomer; there were two classes—pleasure cars and work cars. For those that wanted the greatest mileage for the least number of dollars the small four-cylinder filled the bill. But when the car was used for purely pleasure purposes undoubtedly the six-cylinder would remain.

Mr. Coffin thought that there was a perceptible difference in the noise of the four and six car and in the smoothness in running. It was possible to drive a six faster in traffic than a four without creating the impression of speed in the minds of others, even police officers. Undoubtedly the four-cylinder four-speed car performed wonderfully and would do as much rough work as any other. There would always be a demand for a small four, but the speaker thought that the big four would disappear. It was rather a pocket-book need than sentimentality. As far as fitting a heavy flywheel to a four-cylinder, as one of the speakers suggested, Mr. Coffin said that he did not think that this combination gave the same result as a six-cylinder motor.

Mr. Pope suggested that it would be interesting to hear members' opinions upon the advisability of fitting six-cylinder motors in trucks.

Mr. Trask stated that as the six-cylinder was a luxury he did not see that it was necessary to fit them in trucks. Further the decrease of horsepower in truck motors may also have an influence on the matter.

Mr. Riker said that with regard to the question of six-cylinder motors for trucks there were the items of economy and original cost to be taken into consideration. The matter of vibration was not so vital. In many cases in trucks enormous masses had to be accelerated and it was not a question of high gear drive all the time.

Gearbox Location Arguments

The final topic dealt with at the meeting related to the position of the gearbox. **The members were asked to express their views as to the best method; whether the gearbox forming a unit with the motor was better than when coupled up with the rear axle or was the individual unit type with the gearbox amidships better than either.**

Mr. Coffin started the discussion, stating that in his various connections in the last 5 years he had had occasion to observe the performance of cars with all the above mentioned types. In cases where the motor was coupled with the gearbox, forming a single unit, he had used both single and double universal joints and as there would be lost motion in any case he thought it was better to have as few joints as possible. When placed amidships the alignment of the gearbox is subjected to distortion through frame deflections, making numerous joints necessary, and for this reason the unit motor or unit axle types were preferable. When placed on the rear axle in the form of a unit with it there is an additional amount of uncushioned weight on the tires. He found in experience that a gearbox of this class makes it difficult to drive the car through sand and rough roads. Another objection is that it is necessary to fit both brakes on the rear wheels. When the motor and gearbox are a unit, the latter is entirely independent of any frame action. It simplifies manufacture and assembly and further reduces the number of joints and consequently eliminates lost motion as much as possible.

Mr. Marmon stated that the gearbox being placed on the rear axle does not increase the uncushioned weight any more than the addition of a demountable rim would. By placing the gearbox back a quieter drive is obtained. He thought that it was more accessible for making repairs, and further that on low gears there is less torque and it is possible to fit a long drive shaft of small diameter.

Mr. Dennison said that he built a car 2 years ago with the gearbox and rear axle in a unit and found that the car held the road better.

Mr. Riker thought that for the small power plant that the unit-motor or unit-axle types were good; but the position of the gearbox largely depended upon the power. On large cars it was better to place the gearbox amidships as it gives better distribution of weight. The reason that double chain drive cars held the road best of all was the method of weight distribution.

Mr. Brockman said that the company he was connected with has made both types and has found that when the motor and gearbox are in a unit and when any repairs are necessary it means tearing the unit to pieces.

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Breaks Philadelphia-New York Record

NEW YORK, Jan. 16—The Philadelphia to New York record by motor truck of 8 hours and 45 minutes was lowered by 14 minutes today when the transcontinental Alco truck bettered its own previous best mark despite muddy going, heavy rains and thick fog.

Carrying a cargo of thirty boxes of soap, consigned by its owners, Charles W. Young & Company, of Philadelphia, to Schwarzenbach, Huber & Company, a large silk manufacturing concern in West Hoboken, the big freighter made the journey in 8 hours and 31 minutes. The load transported by the truck weighed 8,247 pounds.

Low-Grade Fuel For Motor Trucks

By N. B. Pope

Paper Read at the Winter Meeting of the Society of Automobile Engineers in New York City, January 16

¶ One truck consumes in the course of 1 year about three times as much gasoline as one pleasure car. In a broad way, therefore, the introduction of cheaper fuels for commercial vehicles should afford immediate and progressively increasing relief for the fuel market.

¶ Using gasoline, the fuel cost represents 10 per cent. of the total cost of operation. As immediate substitutes for gasoline, there are available kerosene, distillate and naphtha. There is little question of thermal equivalents in comparing these fuels with gasoline, what little difference there is being in favor of the heavier products.

¶ The bondage of the automobile industry to petroleum is largely traditional. Petroleum products must be employed exclusively as fuel only so long as they are cheaper than other fuels and both truck users and manufacturers should be brought to realize this fact.

WE are approaching a point where the stringency of the fuel market must become painfully evident to the motor vehicle user and indirectly to the motor vehicle manufacturer as well. Premonitory symptoms are: 1—continued degradation of the gasoline of commerce; 2—increased prices for gasoline, which at present are trending in a mysterious manner toward a fairly uniform advance of nearly 90 per cent. over the ruling wholesale rates of 1 year ago; and, 3—advances in the price of fuel oil east of the Rocky mountains, indicating in some measure the effect of rapidly increasing consumption for all petroleum products.

There is good reason to hope that the fuel difficulty may be relieved in large degree by coöperation between the automobile maker and the refiner, but the result of such coöperation cannot under the circumstances be realized for a period of months, possibly of several years. Its logical outcome would at best be an agreement on one or more standard grades of fuel of lower gravity and volatility than are common at present.

Meanwhile the commercial vehicle is rapidly becoming an important factor in increasing the total consumption of gasoline. **Taking a rough average of all motor vehicles in use, one truck may be said to consume in the course of a year about three times as much gasoline as one pleasure car.** Hence the great increase in commercial vehicle production must cause the motor truck to exert a preponderating influence on the fuel market as soon as the number of trucks in use exceeds one-third of the number of active pleasure cars. **In a broad way, therefore, the introduction of low-grade and cheaper fuels for commercial vehicles should afford immediate and progressively increasing relief for the fuel market.**

From the user's point of view the possible reduction in the cost of fuel is far from negligible. **Using gasoline, the fuel cost represents at least 10 per cent. of the total cost of operation.** Usually it is more. Assuming that by the employment of low-grade fuels a saving of from 30 to 40 per cent. of the fuel bill could be effected, and assuming the same consumption for the low-grade fuel as for gasoline, the substitution of the cheaper fuel would insure a minimum saving of 3 to 4 per cent. in the total cost of operation. Unquestionably the overall saving should be even greater, and by careful development of special carbureters and slow-speed motors for the purpose it is probable that the inducement to the user can be considerably increased. Indeed, one maker on the Pacific Coast, using engine distillate as fuel, claims a saving of 50 per cent. on the fuel bill and a 20 per cent. increase in power by doing away with gasoline.

PRESENT AVAILABLE FUELS

As immediate substitutes for gasoline there are available: kerosene, distillate and naphtha.

Kerosene is exceedingly plentiful, low in cost, uniform in quality, promises to continue in abundance and, if demanded in large quantities for motor fuel, could be disposed of in the domestic market with greater profit to the refiner than when marketed abroad, as is so largely done at present.

Engine distillate is a product obtained from the western crude oils after the lighter fractions have been distilled off, and, in a way, is analogous to kerosene in respect to its position in the scale of petroleum derivatives. It is less thoroughly refined, however, and at present is to be considered principally as a local product. That its practical equivalent could be produced from other asphaltic oils, such as those of Texas and Mexico, I believe to be the case.

Naphtha is as indefinite a term as gasoline. In its present use it is intended to embrace not only the heavier fractions that commonly are included with the gasoline distillation, but also the fractions between gasoline and kerosene, which are at present lost to the automobile fuel market. Being slightly more volatile than kerosene and moreover free from the doubtful reputation that kerosene enjoys as a fuel, it should prove easier to introduce, first, because the user is in no wise prejudiced against it, and second, because its employment entails less experimental development.

FUEL VALUES

In considering the comparative utility of different fuels, particularly as between gasoline and the lower-grade petroleum distillates, there is little question of thermal equivalents. **Whatever difference exists is, if anything, in favor of the heavier products.** Volatility, however, as expressing the ease with which the mixture may be generated, is of paramount importance. Volatility, viscosity and gravity together indicate the comparative facility with which a fuel can be reduced to the condition of a dry or wet mixture and so delivered to the engine.

CARBURETION

In considering the lower-grade fuels it is necessary thus to distinguish between the carburetability and combustibility. That a liquid cannot be carbureted by ordinary methods need not condemn it for use in the internal combustion engine, but it does exclude it from consideration as a fuel for automobiles of present construction. In this way it is perfectly true that the carbureter is really the determining factor in fuel selection. As the values of volatility, viscosity and gravity are lowered the fuel becomes, respectively, harder to vaporize, more difficult to force through small orifices (having a higher coefficient of discharge) and requires a greater lifting effect (suction) to overcome its superior mass per unit of volume. With the heavier fuels, therefore, different proportions must be employed in the carbureter in order to obtain results corresponding to those obtained in successful instruments designed for gasoline.

The quantitative expression for the relation of these all-important area and velocity relations is still locked in the designer's breast, but it is evident at least that a carbureter designed for heavy fuel may be more satisfactorily operated with gasoline than a gasoline carbureter with heavier fuel. To assist in the vaporization of the lower-grade fuels more heat is necessary than for gasoline. This is due largely to the fact that the latent heat of the heavier fuels is greater than that of gasoline. With the lighter fuels, such, for example, as 76-degree gasoline, a larger proportion of the fuel may be vaporized completely before the mixture reaches the cylinders. With the heavier fuels, on the other hand, most of the fuel reaches the cylinders in atomized liquid form.

The application of heat to assist the vaporizing action may be continued profitably only up to the point where volumetric efficiency is affected adversely. So long as the heat supplied to the mixture is absorbed in raising the temperature of the liquid particles, or in vaporizing the fuel, the volumetric efficiency will not be reduced, since the temperature of the mixture will not be raised; but the partial

insulation of the liquid by the surrounding medium of air and fuel vapor prevents a free interchange of heat, particularly in view of the high velocities involved. For this reason the quantity of heat than can be supplied is less than that required to bring even the lighter fractions to the boiling point and convert them into vapor.

That a certain loss of volumetric efficiency can be employed profitably as an offset to the non-homogeneous and consequently slow-burning mixtures that otherwise would result is, however, probable. The law of compromise will stand considerable investigation in this respect.

High velocities likewise, while tending to promote evaporation by mechanical action on the liquid particles, can be employed only to the limiting point where the volume of the charge is reduced by excessive fluid friction. Practically speaking, both methods must be used in combination. In any case, however, it must be borne in mind that the bulk of the vaporizing process with the heavier fuels must be carried on within the cylinder during the compression period.

The design of the heavy-fuel instrument, therefore, must be postulated on the theory that it will handle at all times a wet mixture, and due provision must be made against the separation of the liquid component by baffling surfaces. Furthermore, since a certain amount of separation must occur from this cause, with consequent tendency to "loading" of the mixture under certain running conditions, its effect must be minimized as far as possible by providing ample heating for all critical points in the manifolds and ports.

STARTING

However successfully a carbureter for low-grade fuels may be made to function under normal running conditions, starting will be rendered difficult in just the degree that normal operation is dependent on heat supplied. Of the two available methods of counteracting this difficulty—one the supplying of artificial heat prior to starting and the other the use of a more volatile fuel for the first few charges—the latter is by far the simpler and easier to accomplish. Where normal carburetion is dependent largely on high velocities to convey the mixture to the cylinders, starting the motor when cold is accomplished more easily. Ease of starting thus becomes, as it were, inversely proportional to the normal heating-effect and directly proportional to the normal velocity-effect under running conditions. Hence it is reasonable to conclude that a mechanical starting device will always be required for low-grade fuel motors, and that in addition either the use of a high-grade fuel for the first few moments of operation will be necessary, or else a method of priming. In many respects the latter method is preferable, especially if acetylene be used, since it permits starting without special carbureter adjustment (other than choking of the air), simplifies bi-fuel tank and piping complication, and further introduces into the primary charges a high-velocity combustible which serves as kindling material for what is practically a normal charge.

There is every reason to believe that in the natural course of events engine-starting appliances will soon become a practical necessity on all motor vehicles, so that the development of such devices for commercial vehicles in connection with the adoption of low-grade fuels need not be viewed in the light of a special and purely incidental burden. Practically speaking, starters are more necessary on commercial vehicles than on pleasure cars, through their economic advantage in conserving the driver's energy and because they permit the shutting down of the engine for all loading stops.

COMBUSTION

On combustion the lower-grade fuels, containing as they do larger proportions of unsaturated hydrocarbons, give rise to more complex reactions than the higher-grade fuels, with consequent tendencies to the deposition of free carbon. Due to the complicated nature of the process, and on the hypothesis that certain of the reactions must proceed in sequence, flame propagation is less rapid with the heavier hydrocarbon, even with homogeneous mixtures that are properly proportioned. With incompletely vaporized mixtures, or those which are not agitated during the compression stroke and which in consequence may be described as in a "lumpy" condition, combustion will be further delayed by the completion of the mixing process as a result of the agitation of the flame waves. Because of this double retarding influence, slow combustion almost invariably accompanies the use of the lower-grade fuels, which are in consequence suitable for slow-speed motors only, so long as carbureting methods aproximating those at present in use are retained. As the slow-speed engine is well adapted in other respects for commercial vehicle use, however, it follows inversely that the heavier fuels are particularly adaptable to commercial vehicle purposes.

DEVELOPMENT

As a large proportion of commercial vehicle types may be said more truly to be in the early stages of evolution than are pleasure vehicles, it follows that the adaptation of special apparatus for handling low-grade fuels will work less hardship on the truck manufacturer than it would if forced on the builder of established types of pleasure vehicle. Further, the higher valuation placed on operating economy by the commercial vehicle purchaser must tend to render the kerosene or naphtha-burning machine a more acceptable offering in that field than a pleasure car possessing the same feature would be in its field. Indeed, were it possible to offer almost any large truck user a carbureter that would handle a low-grade fuel as efficiently as his present carbureter handles gasoline, there is little question that he would accept the substitute immediately, on the basis of a not unreasonable performance guarantee.

NEED OF POPULAR EDUCATION

It will be objected that so long as the commercial vehicle user sees countless pleasure cars operated on gasoline, he will continue to be skeptical about the need or advantage of changing to a substitute fuel—even in the face of high and continually rising prices for gasoline; which is largely true. Above all things, there is need that motor vehicle users of every class be taught to discriminate in the matter of fuels—that they be taught that it is possible to offset rising gasoline prices by the adoption of lower-grade substitutes, and not improbably in the future by the adoption of manufactured fuels derived from various sources. The bondage of the automobile industry to petroleum is largely traditional. Petroleum products must be employed exclusively as fuel only so long as they are cheaper than other fuels. As a matter of self-protection the automobile manufacturer should assist in spreading this truth.

Granted the possibility of adopting a fair working standard for motor fuels, introducing one or more low-cost substitutes for gasoline, such an educational program could be readily put under way. Otherwise the process must be slower and more difficult. Let one or two successful manufacturers exploit models specifically intended for low-grade fuels, however, and the movement will be well inaugurated. What one small concern in its isolated territory west of the Rockies has done from the very beginning of its career, other and better equipped makers can do without fear of failure, and without risking a staggering capital investment. Once the movement is really started and the truck user learns that he can reduce materially his outlay for fuel without sacrifice of serviceability, the battle will be more than half won. And when the pregnancy of the present fuel situation is fully understood, the strategic advantage of such a development can be well appreciated.

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Harking Back a Decade

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FROM THE AUTOMOBILE of January 24, 1903:

The surprise of the 1903 show is the revelation of willingness of the American public to pay several thousand dollars each for large and powerful gasoline wagons fitted with the tonneau, either detachable or built in. Freedom of observation and display are combined in this form of self-driven carriage, and this possibility of seeing and being seen, and the sense of power and mastery which come from the control of a large and powerful and showy structure, is the secret of the popularity of the tonneau form of carriage body.

For elegance of translation and freedom from all contingencies of delay, the electric vehicle is beyond criticism.

The water-cooled hand brake on the differential, and occasionally on the countershaft as well, shows no alteration. Neither of these positions are commendable.

The committee of the Chicago Automobile Club on entertainment at the coming automobile show is busily at work. Handsome quarters will be fitted up at the Coliseum, where good cheer and other things will be on tap, with the genial Frank X. Mudd in charge. Open house will be the order of the day at the clubhouse also.

Digest of the Leading Foreign Journals

Continued Discussion of Mechanical Means To Be Adopted To Operate Automobiles With Diesel Motor Fuels—Keeping Lubricating Oil Out of the Combustion Chamber—Help for Poor Tourists—Twin Tires for Runabouts

PROSPECTS of Diesel Motors for Automobiles, II.—In last week's issue an excerpt of an article by Otto Malms of Mannheim was presented in which it was explained why and how two of the principal difficulties in applying the Diesel motor and fuel system to small high-speed automobile motors could be overcome, although they have not been overcome in practice as yet. It was shown that the problem of reducing the weight of the Diesel motor was solving itself through the lessons learned in building aviation motors and that the introduction of very small and accurately measured amounts of heavy oil in the fuel nozzle of each cylinder at a speed rate up to 12 to 15 times per second, as required for automobile motors, could be managed and, more particularly, could be managed so as to make the amount introduced for each combustion independent of the motor speed. The method proposed was that of driving two pumps, by reduction gearing from the crankshaft, in a special manner producing a continuous and constant stream of fuel from a reservoir into a pressure channel—the flow and therefore the pressure created in the channel being subject to regulation by variation of the pump piston strokes—and the method also involved taking the fuel from the presssure channel to the cylinder nozzles by means of needle valves with a cam-operated stroke on a plan shown in an accompanying illustration (Fig. 3 last week).

The author shows that with such a system the practical troubles encountered in trying to measure separately and individually the infinitesimal dose for each combustion are effectually obviated. For example, a 4-cylinder motor with a 100-millimeter stroke, giving 40 horsepowers at 1,400 revolutions per minute, requires for each power stroke in each cylinder 0.06 cubic centimeter of fuel, and a twin pressure pump of the kind proposed, which rotates 35 times slower than the motor shaft, would have to have a 35 times larger piston displacement for each pump. That is, each piston must at each stroke furnish 2.1 cubic centimeters of fuel. Accordingly, the pumps should make 40 revolutions per minute and, with a stroke of 15 millimeters should have a diameter of 13.3 millimeters—all of which comes within practicable working limits, so far as the dimensions are concerned, while the very low rotation-speeds of the cams which operate the pistons guarantees minimum wear and safe working of the suction and pressure valves. [Since in automobile practice it is not the object to produce automatically a strictly constant speed with a variable load, it is perhaps unimportant that the opening of the needle valves under the author's plan still depends for its duration upon the motor speed—in inverse proportion—and that the adjustment of the fuel pump and the resulting pressures in the fuel channel therefore cannot coincide exactly with the variations of the load. It seems to be the author's idea that the pressures will automatically take care of the feed to the cylinder nozzles through the needle valves, and this may indeed be the case if the dimensions of the needle valves are chosen so large as to admit a maximum dose of fuel in the minimum time of valve opening (corresponding to the maximum motor speed) without any larger back-pressures than are admissible in the pump mechanism. A complicated question relating to the balancing of pressures seems, however, to be involved.—ED.]

In a later instalment of his article Mr. Malms discusses the third important difficulty in adapting the Diesel system, with its very important advantages, to automobile conditions. It relates to the atomizing of the fuel and its forcible injection in this form into the cylinder against a very high compression—a compression high enough to cause immediate ignition. So far, this has in all successful Diesel motor constructions been done by means of a compound air compressor with intermediate water cooling, the air being sent from this compressor at a pressure of 50 to 60 atmospheres to a steel storage bottle from which some of it is let loose at the beginning of each working stroke of each cylinder, thereby carrying the fuel charge before it and atomizing it by forcing it through a more or less obstructed channel. All other methods have proved faulty in practice and would prove still less available at the speed of automobile motors. [The author here enumerates the faulty methods which have been tried out and gives the reasons for their failure.—ED.]

In a general way it may be said that the main requirement under the Diesel system is that every particle of fuel, when it is blown into the cylinder, shall find at once all the oxygen needed for its combustion, and only the injection by a stream of compressed air complies with this requirement. The important question is therefore whether the air compressor can be adapted to automobile conditions, and this is so much more decisive as a Diesel motor with its 30 atmospheres of compression cannot be started by cranking, so that the compressed air will be needed for starting purposes anyway.

COMPOUND COMPRESSOR THE SIMPLEST FOR THE WORK.

An arrangement for getting along with a simple compressor instead of a compound one takes the form of using the motor cylinder itself for the first compression, as may be done by proportioning the combustion chamber for a higher compression than is wanted and then tapping air from it to the single compressor during the compression stroke in the motor cylinder. In this manner air can be fed to the compressor at about 10 atmospheres, but this system becomes more complicated than a compound separate compressor in the case of a 4-cylinder motor, as air must be taken from all of them to make them operate alike. The number of conduits and cams required for this would seriously encumber the engine. In addition, this system, which is not much used, even in stationary single-cylinder motors, involves a loss of efficiency, as the air taken from the cylinder is at a high temperature and consequently considerably expanded.

The difficulties in designing a compound compressor to run at high speed are numerous however, and the compressor cannot be geared down, as it would become too heavy and large. They relate largely to finding room for valves of sufficient dimensions for the high-speed work and to certain troubles with the lubricating oil which finds its way under the piston rings into the partial vacuum created in the compressor.

A construction intended to overcome these troubles and meet the needs for an air-compressor in an automobile motor oper-

ated at high speed on the Diesel system, and with heavy oil as fuel, is shown diagrammatically in Fig. 1.

To get room for large valves, especially in the low-pressure portion, the two pistons are separated and are driven individually. This releases the whole top of the low-pressure cylinder for valve purposes. In other cases both pressure and suction valves are located here, but in this construction the size of the pressure valve is doubled by replacing the suction valve with slits in the cylinder wall which are uncovered by the piston toward the end of the suction stroke.

The low-pressure piston *a* is driven from the crank *b*. The knuckle *c* of the connecting-rod carries an arm *d* which, by means of a pair of rods *e* actuates the high-pressure piston *f*. Instead of this arrangement two cranks could be provided and the high-pressure cylinder could be placed in front of the low-pressure cylinder. This would make the whole engine longer, but, on the other hand, it would make it possible to balance the moving masses in the two cylinders by offsetting the cranks 180 degrees.

The high-pressure cylinder has a guide *g* which is incorporated in the cylinder body by means of the flange *h* and has a slit *i* in which the bolt *k*, projecting on both sides and secured to the ends of rods *e*, can slide with the piston *f*. The group of piston rings *l* is, in the highest position of the piston, underneath the slit *m*, so that in no position of the piston the compressed air which enters at *m*, coming from the intermediate water-cooling chamber, can escape along the lower portion of the piston into the crankchamber.

In the low-pressure cylinder, air enters at *n* at the lowest position of the piston *a*. It is compressed to about 10 atmospheres by the upstroke and is pushed through a group of ball valves *o*, whose motion is limited by a perforated plate *y*, into a conduit leading to the cooling device. Taken thence to the high-pressure cylinder by way of slit *m* it is compressed to 50 to 60 atmospheres and is pushed through the pressure valve *q* into a steel bottle. The unmentioned features may be as customary in the construction of Diesel motors.

Considering that the problem of adapting the Diesel system to automobile conditions is of far greater ultimate practical importance than other current motor problems and that, for example the question of the superiority of sleeve-valve and rotary valve motors over poppet valve motor dwindles to insignificance in comparison, unless it is discussed with reference to the different adaptability of these types for being operated with any and all of the fuels which can be burned in a Diesel motor, it may be of interest to look into the merits of the proposed air-compressor a little closer.

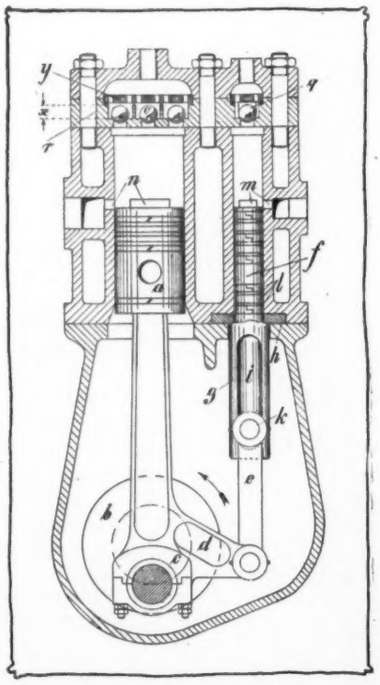

Fig. 1—Proposed compound air-compressor for automobile Diesel motors

The use of slits to take the place of suction valves has the disadvantage that a sharp depression is produced temporarily in the compressor cylinders during the suction stroke, to be relieved only toward the end of the stroke when the slit is uncovered. While experience has proved that the slit can be made large enough to assure the complete filling of the compressor cylinders with air, even at the highest speeds, it is undeniable that the tendency to vacuum formation means a small loss of efficiency, as a mean back pressure of about one-half of an atmosphere —7 pounds—has to be overcome during the suction stroke. As however the power consumption of the compressor amounts to only about 6 per cent. of the maximum power output of the motor, the loss caused by using slits instead of valves is in reality negligible. The possibility that lubricating oil may be drawn past the piston during the temporary vacuum, and that this oil may find its way into the cooling device and finally into the high pressure steel bottle, is more serious, as it may give rise to explosions in the high-pressure portions of the compressor, especially as the cooling water in an automobile motor cannot be kept at as low a temperature as in a stationary motor of low speed.

It is this possibility which is obviated in the construction shown in Fig. 1, by lengthening of the pistons and the use of piston rings at the lower ends.

WHY PISTON RINGS FAIL UNDER SUCTION

The need of this provision may not be apparent to all, as the causes which lead to leakage of lubricating oil around the pistons are not generally understood. That even in an ordinary automobile motor oil is drawn into the combustion chamber during the suction stroke seems at first blush inexplicable. A piston which remains tight under a high pressure of 25 atmospheres, as is produced an instant after the ignition of a charge, should apparently be expected to remain tight also under a depression amounting to not more than one-tenth of an atmosphere during the suction stroke of an automobile motor and to not more than one-half of an atmosphere in the proposed compressor. But the fact is that piston rings employed in the customary manner are adapted for tightening against compression only. During the compression and working strokes a small portion of the compressed air and of the explosion gases is forced into the grooves of the upper piston rings and assists in expanding the latter against the cylinder wall, so that no oil or gas can escape there. Otherwise at the suction stroke; the depression which also finds its way to the grooves back of the upper rings contracts the rings instead of expanding them, and the oil coating the cylinder wall therefore passes freely into the combustion chamber.

With the proposed compressor construction, on the other hand, the depression which may pass the upper rings is neutralized by the air entering at the intake slit, while the lower ring is protected against the effects of depression through the existence of the slit and, on the contrary, scrapes the oil on the cylinder wall back into the crankcasing. In the case of the high-pressure piston, several lower rings are provided, so that the air taken in at the suction slit at about 10 atmospheric pressures shall not escape around the piston downward to the crankcase when the piston is at the top of its stroke.

STARTING BY BY-PASSING AIR TO CYLINDER

The manner in which an automobile Diesel motor with open fuel nozzle should be arranged to facilitate starting remains to be explained. Parallel with the main channel of the nozzle another channel is provided which at its lower end opens into the motor cylinder and at its upper end can be connected, by means of a special valve, with the nozzle cavity immediately below the air-injection valve. The latter is so dimensioned and operated as to admit more air than the narrow nozzle channel will pass into the cylinder. When starting, one opens the valve to this bypass channel, with the result that a quantity of air corresponding to the full capacity of the air-injection valve enters the cylinder, filling it with air of the required compression. Such starting valves should thus be provided for each of the motor cylinders and may be opened simultaneously with a lever. If, before the compressed air is admitted, the piston in one of the cylinders is turned to a little past dead center, this cylinder will be started at once when the air is admitted, as the

normal injection in that case is also timed right for the starting. After the first few turns the bypass valves should be closed, so that the pressure air will pass through the nozzle only.

Summarizing, it seems that beyond a doubt the question of whether the Diesel system can be adapted to automobile motors must be answered in the affirmative. That the work leading to this eventually inevitable result has not yet been done may perhaps be ascribed to the fact that engineers who are familiar with Diesel motors as a rule do not appreciate what the requirements of an automobile motor are, and that automobile motor engineers, on the other hand, have not had time to familiarize themselves with the history and workings of Diesel motors.—From *Allgemeine Automobil-Zeitung*, December 20 and 27.

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COMMON Carrier Automobile Lines.—In France, as well as in other countries, it has been observed that enterprises organized for the purpose of offering the general public transportation by means of motor vehicles are usually launched without much knowledge of either the technical or the commercial requirements and that the average result is poor and expensive service. This applies to livery work in minor cities and country districts and especially to stage lines and touring route service.

With a view to remedying this situation the Automobile Club of France held during the recent Paris automobile salon a convention which was designated as the First Congress of Common Carrier Transportation by Automobiles and which was numerously attended at all of its meetings by persons prominent in public and business life, showing that the interest in the question was widespread.

It appeared from the information offered on this occasion that the habit of automobile owners to make frequent tours to the scenic portions of France has developed a popular desire for similar automobile touring among those portions of the public to whom the individual ownership of an automobile is either financially out of the question or does not seem advisable until some experience in the advantages of automobile travel has been gained by them. To meet this new want many touring routes have been established, while many of the motor stage lines subsidized by the state or community have derived an additional income from the new tendency and in some cases have made additions to their stock of vehicles and have extended and modified their routes. It was stated that subsidized stage service exists in 16 of the departments (counties) and received a subsidy in 1912 of 500,000 francs. The number of lines reaches at present 300, covering a mileage of 8,000 kilometers, and these are served by 450 automobiles. The service is partly all the year round and partly only for the summer season.

In Italy the subsidy plan has been taken up with considerable vim, as the premiums in 1912 amounted to 2,848,511 francs, while the lines number only 162, covering a mileage of 6,600 kilometers.

At all sight-seeing centers, it appears, the number of visitors has been increased very notably by virtue of the facilities now offered for making rapid one-day round-trips in automobile Alpen-cars or omnibuses and for connecting from one railway to another. In certain formerly inaccessible places winter sports have become fashionable through the same means.

It was a subject for comment at the congress that the vehicles placed in service are unsuited for carrying either the amount of baggage or the bicycles which the passengers wish to take along, and a resolution was adopted providing for a competition for baggage-carrying devices for common-carrier automobiles. The same resolution also expressed a desire for a contest of motor sleighs, especially with a view to developing a high-power sleigh capable of making its way under the most unfavorable conditions of the roads and of the snow.

A comparison of the expense in running three routes in the French Alps, all served with Alpen-cars seating 18 passengers each, revealed the peculiar condition that the smallest of these routes, with five vehicles, cost only 0.90 franc per kilometer to operate, while the second one, operating from 5 to 8 vehicles, cost 1.30 franc and the most important enterprise of the three, with 8 to 18 vehicles in commission, cost 1.60 franc. The operating conditions were similar, but the overhead and administration expenses grew faster than the number of vehicles employed.

The congress received a large number of communications relating to the most economical construction of common-carrier automobiles—mostly with reference to touring service—and also wth regard to financial organization and road improvements. It was brought to a close with the formation of a national federation of those most competent to give counsel in the matter of establishing public automobile services.—From *Génie Civil*, December 28.

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FUTURE for Small Pneumatic Twin Tires.—"The twin construction solves the problem of the pneumatic tire for the future. At present the twin type is used only for large vehicles and it does wonders for it, speaking from my own experience. I have a car with a 4-cylinder motor, 100 by 160 millimeters bore and stroke. It is fast and weighs 1,950 kilograms without load. Single rear tires, 120 millimeters (nearly 5 inches) broad, lasted for 1,200 to 1,500 kilometers. I had it fitted with twin tires of 120 millimeters each, and these tires have made so far 5,000 kilometers. I am convinced they will make 5,000 kilometers more.

"It is said that the twin tire drags. That is true for the large widths, but what is to hinder twinning in small widths for light vehicles? Why not twin with 105, 90 and even down to 75 millimeter sizes?

"I am convinced that in a few years twin tires will be used on down to 12-horsepower cars, in 75 and 85 sizes. That will compel the use of two sizes for one car, with single 90 or 105 sizes on the front wheels, but it will involve such a saving and such a security that the inconvenience will be eclipsed by the enormous advantages.

"The twin tire is the one great improvement realized in pneumatics for some years back and it is a duty to give credit to the two firms—Kapferer and Michélin—who made its use possible by providing wheels for it.

"The only objection raised against the twin tire refers to its looks. Some people find it clumsy. As soon as it is generally used they will find it pretty."—Mortimer-Mégret in *La Pratique Automobile*, December 25.

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FLUX for Autogenous Welding.—The employment of flux for cleansing and de-oxidizing the joint of an autogeneous weld was considered a useless precaution when the new art was first taken up. It was an expedient reserved for beginners and unskilled workmen. But it has now been generally adopted even for the welding of iron and extra-mild steel. As it has become recognized that the best weld is one which has been effected in the shortest posssible time, the new work methods, involving the use of fluxing powders which promote the intimate union of the metal fused by the heat of the oxy-acetylene burner, are evidently most to be recommended. Unfortunately, however, the fluxing powders are utilized in a haphazard manner at most shops, while certain precautions are necessary to obtain the maximum useful effect with a minimum waste of flux and weld-metal material.

The best way of using a flux powder consists in dipping the end of the weld-metal bar from time to time into the can with the flux and then placing the weld-metal on the line of the weld.

If the powder is suitable, the quantity of it which is applied to the fused metal by this method is sufficient to assure a sound joint. Hence it is useless to sprinkle the powder along the line of fusion, a process which nearly always results in the formation of blowholes and involves an enormous waste of the auxiliary materials.—From *Revue de la Soudure Autogène*, December.

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Easy on the Hand.—Every speed lever now has a ball at the top and their manipulation is considerably facilitated thereby.—From Paris Show notes in *Omnia*, December 21.

Communications from The Manufacturer

V. A. Longaker Outlines the Advantages of Large-Diameter Wheels and The Underslung Frame

INDIANAPOLIS, IND.—The advantages of large diameter wheels are self-evident. Strange as it may seem, the only question ever raised is the one as to tire cost. The advantages of large diameter tires are so fully appreciated by the tire manufacturers that they are encouraging the use of large diameter tires by making a concession in the price. By referring to a price list of any of the large tire manufacturers, it will be found that the price of a 41 by 4.5-inch casing is less than the price of a 36 by 5. This hardly seems reasonable to the casual observer. The 41 by 4.5-inch casing must contain a greater amount of rubber and canvas, and certainly it takes a greater length of time to build the body of the tire, owing to the larger diameter. The fact that the difference in the list price is in favor of 41-inch tires can only be explained in that the tire manufacturer is endeavoring to encourage the use of large diameter tires, no doubt reasoning with his own mind that the large wheel is the only solution of the tire problem.

The perfecting of the pneumatic tire has not progressed with the rapid development of the automobile. In fact, the pneumatic tire is the weak point in the construction of the car. Anything which the car manufacturer can do to help overcome the one weak point which has had the greatest retarding effect and the one thing which has been the source of the greatest expense in the maintenance of a car, certainly deserves the attention of the progressive designer.

The theoretical reason why the 41-inch tire has a much longer life than tires of a smaller diameter is that the angle formed by that portion of the circumference of the tire where it makes contact with the road is smaller. As a result, an obstruction in the road of a given height being passed over by the larger wheel, does not cause the wheel to rise so abruptly. In other words, the greater this angle, the more quickly the wheel is called upon to rise. The blow of the contact of this obstruction is consequently greater. Owing to the increased radius of the arc at that portion of the tire which is in contact with the ground, a great many small depressions in the road can be bridged. If the wheel was to drop into these depressions, the fall would result in practically the same kind of a blow being applied to the tire as if it were passing over an obstruction which stands above the surface of the road. The greater number of these small, but nevertheless telling, blows that can be overcome will not only prolong the life of the tires, but will also result in the entire mechanism of the car being greatly protected.

Vibration Must Be Minimized

Vibration in itself can in a way be compared to a great many blows of greater or less magnitude being applied with greater or less rapidity. The blow of a hammer, for instance, no matter how small it may be, if kept up sufficiently long will destroy the best piece of armor plate. Vibration is the greatest enemy the motor car of today has to contend with. The large wheels not only lengthen the life of the tires, but prolong the life of the rest of the car as well. In early automobile construction this important factor of vibration was not as fully appreciated as it is at the present time. The early builder found that certain parts of his car were failing. In his early calculations the part may have been designed with the factor of safety in view; however, the all-important question of vibration was overlooked. This problem of vibration has created the demand for the alloyed steels which enter into the construction of the automobile of today to such an extent.

Another reason why the large diameter tire will give a greater mileage is that the length of the cord which is formed by the surface of the road depressing the periphery of the tire is much greater; for instance a 36-inch tire having a 5-inch section, properly inflated (89 pounds), will have a contact surface in the form of an ellipse approximately 1.75 inches in width by 7.5 inches in length. The area of contact of the 41-inch tire, properly inflated and carrying the same load, is approximately 8.5 by 1 15-16 inches. The area of the first contact surface is 10.3 square inches, and the second 12.3 square inches, or a gain of 20 per cent.

The increased length of the contact with the road not only has its advantage in the surface wear of the tire, but also plays an important part in the ability of the tire to withstand the enormous strains which are applied in the driving and the retarding of the car to that portion of the tire which is in contact with the ground. The reason for this is that there is a greater per cent. of the periphery of the tire which is carrying the load, and owing to the load being applied over a greater portion of the tire, the strain is more equally distributed.

Keeping the Car Low a Problem

The ideal condition as far as the load being applied to tires is concerned, would be to distribute the load throughout the whole circumference. This, however, is absolutely impossible, consequently anything that can be done to increase the amount of the surface of the tire which is carrying the load will certainly tend to improve its wearing quality. The most important reason why automobile manufacturers have been averse to the application of the large diameter wheels is that when these wheels are used in the construction of a car having an overslung frame, owing to the assembly problems which are encountered, the car by necessity is decidedly higher. From the viewpoint of safety as well as the idea the buying public has today, a car must be low in order to be acceptable. The thing which determines how low a car can be built is the road clearance. In the construction of our underslung cars we have four all-important advantages: large wheels; a maximum road clearance, 12.25 inches, which is from 2 to 3 inches more than the ordinary car of today has; and although the maximum prevails as to these two important questions, the total assembly of the mass of the car is well down, for instance, the greatest vertical height of our Traveler is 4.5 feet; the center of gravity of the mass being decidedly low, approximately 23 to 24 inches. The combination of these four very important details results in a car having the greatest possible amount of stability. Where else is it possible for the prospective buyer to find these four important features embodied in the construction of one car?

In traveling around a corner at a high rate of speed in the ordinary overslung car, the driver experiences a sensation as though the car was trying to turn over. The reason for this is that the center of gravity of the car is so high that the springs are called on to carry a much greater additional vertical load, owing to the fact that the mass of this load is so much higher than the horizontal plane in which the springs lie. As a result, the outside springs deflect or flatten out and the frame of the chassis is thrown on a decided angle with the wheel centers.

In our underslung construction, although the corner might be turned at a much higher rate of speed, there is not the faintest indication of this sensation of the car turning over. The reason for this is that in the construction of the car we have overcome the causes as outlined above. The springs, being so nearly in the center of the mass of the car that the effort applied by the centrifugal force caused by the change in the direction of the car, are so near in line with the horizontal center of the mass, that instead of being deflected vertically, the load is applied to the side of the springs. As it is impossible to bend a spring sidewise, the frame of the car is held in an absolutely horizontal position, entirely relieving any sensation of overturning.—V. A. LONGAKER, *American Motors Company.*

Carburetion

Part VI

Subject Digest

Inertia is one of the most important factors in the function of the carbureter for the reason that conditions of rest and motion of the gases are continually changing.

The inertia of a body varies directly as its mass and therefore the inertia of a cubic foot of gasoline is nearly 600 times that of a cubic foot of air. The smaller the quantity of gas which is operated on by a change of throttle position, the less will be the total inertia of the gas in question. A small orifice is therefore a factor in reducing total inertia.

High jet friction is another means of reducing the inertia of the fuel. This condition can be obtained by making the full orifices many in number.

Unless there is a considerable negative pressure at the time of the inlet valve opening the explosive mixture hesitates before entering the cylinder and follows the piston only when the latter is in the quicker part of the stroke.

Surging within the intake pipe occurs at low engine speeds giving rise to irregularities in the action of the carbureter and causing the gasoline at times to blow out of the carbureter air orifice.

by Robert W. A. Brewer

WE will first set down the definition of the word inertia so that we may be quite clear upon this point. Inertia is that property of a body by virtue of which it tends to continue in a state of rest or motion in which it may be placed, until acted on by some force. **Of all the details of an automobile engine the carbureter and the carbureting system is most sensitive to the question of inertia,** for the reason that conditions are continually and rapidly changing, and that the masses of air and gasoline which are dealt with are subject to inertia all the time the engine is working. Were an engine working at a constant load and speed throughout the whole time, the question of inertia would not come in, but as this is not the case we will briefly consider the effect of inertia, both of the air and gasoline, and of the moving parts where an automatic carbureter is concerned.

First let us consider what occurs when the throttle valve is opened and we shall see that, whereas both the air and the gasoline were previously in a state of comparative rest, we immediately impress a force upon them by reason of the engine suction, and the forces which are required to accelerate a given mass in a given time to any different velocity are in proportion to the velocity.

Repeating Newton's second law, "uniform acceleration is produced by any constant force, the latter being measured by the increase of momentum it produces," the force producing an acceleration is equal to $\frac{W}{G} \times F$, where W is the weight of the body G is gravity and F the acceleration, and the final velocity of the body, say V, equals $F \times T$, that is, the velocity V is equal to the acceleration multiplied by the time during which the acceleration acts. Now every body has an inherent quality or inertia by which it tends to resist a change of velocity, and we have, in the case of air and gasoline, two bodies whose inertia is widely different, as the mass of air is nearly 1/600th of the mass of gasoline, or, in other words, a **cubic foot of gasoline weighs nearly 600 times as much as a cubic foot of air.**

In a carbureter system, however, only small quantities of gasoline or air are set in motion by any change of throttle position and engine speed. The smaller the quantity of gasoline which is immediately operated on by a change of engine suction, the less will be the total inertia of the gasoline in question. For this reason **it is advisable to have the gasoline passage between the float chamber and the jet orifice as small as possible,** so that there will not be more appreciable lag than possible when the engine demands an increase in gasoline supply. On the air side, however, the inertia experienced is very slight by reason of the magnitude of the air aperture compared with the fuel aperture, and the immediate result of throttle opening is ordinarily a poor mixture, as the air enters the mixing chamber more readily than does the fuel. Conversely, when the throttle is quickly shut down there is always the tendency of the fuel to continue flowing by reason of the inertia of the fuel in its passage, the result being that a loading up is likely to occur.

It is, nevertheless, possible to design the passages of such small dimensions, and to arrange the friction of the orifices to be so high, that inertia can almost be damped out. **High jet friction is therefore one of the means of counteracting the inertia of the fuel.** This can be obtained by making fuel orifices many in number, as in the Polyrhoe carbureter by giving either a very small unobstructed hole for the fuel supply or a hole of larger dimensions in which some medium is interposed for producing high jet friction.

The question of jet friction plays an important part, as may be supposed, in the question of the inertia, but this may also be complicated by the phenomenon of capillarity, being the tendency for a liquid to creep up a small orifice in a contrary direction to that which it would normally take under the action of gravity. **Capillarity often causes a carbureter to leak** by reason of the liquid either creeping up through the jet or up the stem of the valve which at its lower end dips into a fuel reservoir. This action has caused considerable trouble in certain types of carbureters.

Passing from the carbureter now to the inlet pipe, inertia is an important factor in the design of inlet pipes for all types of engine, whether they be of the single-cylinder or of the multi-cylinder pattern. When we consider a four-cylinder engine firing on the usual system, namely, 1, 3, 4, 2, turbulence is set up in the inlet manifold and this turbulence is further aggravated by the inertia of the explosive mixture passing through that manifold. In such a type of pipe, particularly if the ends terminate abruptly, there is always the tendency for the fuel to load up the outer ends of the pipe, by reason of the two cylinders in one pipe firing in sequence and then the two cylinders of the other pipe. The gas feeds rapidly, first toward one end of the pipe and then toward the other, and the gas flow lags behind the cylinder demand, so that when the inlet valve of either end cylinder is suddenly closed the gas continues to flow down the pipe and banks up with increased richness at the ends. Considerable difficulty has been experienced, particularly in the older patterns of engines, by reason of **the end cylinders getting a different consistency of charge from that which is supplied to the**

middle pair of cylinders. In special designs of inlet pipes for racing cars, great care is often taken to overcome the inertia of the mixture in the pipe, and a continuous flow path is given to the bases by means of either figure-of-eight inlet pipes or circular pipes, so that the gas flow is constant and uni-directional the whole time.

Another effect of the inertia of the incoming mixture is that at the moment of inlet valve opening, unless there is a considerable negative pressure, or pressure below that of the atmosphere, in the cylinder at the time of valve opening, the explosive mixture hesitates before entering the cylinders, and it is only when the acceleration of the piston puts a more or less sudden increase of suction upon the mixture that the mixture itself follows in behind the piston.

It may occur in some engines that a negative pressure of as much as 5 pounds per square inch is momentarily produced somewhere about half-piston stroke, or rather later, before the inertia of the explosive mixture is overcome. After this time the mixture rapidly follows up, and advantage can then be taken of the inertia by retaining the inlet valve open for some considerable time after the outer dead center has been reached.

American practice generally keeps the inlet valve open later than European, as in American design this valve is often held open for some 40 degrees after the outer dead center has been reached. In European practice, however, such a late closing of the inlet valve is seldom found, and this is probably due to the fact that in Europe the valves are of larger diameter.

From the figures previously given it will be evident that **the inertia has a considerable effect upon the carbureter action by reason of pulsations being set up in the inlet pipe,** due to the suction which is necessary to overcome the tendency to lag, but in a high-speed engine these variations usually balance out. Whether they do or do not depends on the length and design of the inlet pipe.

A theory has been propounded that there is a considerable surging effect in the inlet pipe of the majority of engines. This surging undoubtedly occurs at low speed, as has been observed in certain types of carbureters where it has been shown that at certain periods the suction decreases altogether, and the inertia of the gases in the reverse direction after the moment of valve closing causes the gasoline to blow back out of the air orifice of the carbureter.

There is one other point which might be briefly referred to in passing, and that is the inertia of the exhaust gases. We are not, however, dealing with the design of exhaust pipes, but it is interesting to note that **an exhaust pipe can be so designed that the inertia of the gases passing from one cylinder helps to accelerate the exhaustion of the next** by reason of the inertia effect of these gases leaving the end of the exhaust pipe and causing a partial vacuum in the pipe itself. One has sometimes observed a certain amount of suction during the pulsation at the end of an exhaust pipe, and this is entirely due to the scavenging effect due to the inertia of the exhaust gases themselves as they pass out of the exhaust pipe.

Finally, we will, for a moment, touch upon the inertia of moving parts in a constant suction type of instrument, and it will be obvious that when these moving parts depend for their weight upon the depression they produce in the mixing chamber of a carbureter, **the weight of these parts themselves must give them a certain amount of inertia.** The quality termed pick-up, which is often mentioned as a feature of certain carbureters, is also a function of the inertia of the moving parts, for it is obvious that if a throttle be suddenly opened, and a moving part which actuates the fuel and air supply lags and does not immediately respond, the engine does not get away so rapidly as it otherwise might. In the first place, **the engine revolutions must increase to a certain extent before they can produce the necessary suction in the mixing chamber, and then this suction has to operate for some appreciable time upon the moving part before it overcomes this inertia.**

In cases where a spring or other means is employed, in which the question of gravity does not come in to so great an extent, one might think that the inertia of the moving parts would be less, but, as previously explained, a spring is not a desirable feature to perform any definite function in a carbureter system, and should, if possible, be avoided.

Prize of $10,500 Offered for an English Home-Produced Fuel

LONDON, Jan. 2—A prize of $10,500 has been offered by the Society of Motor Manufacturers & Traders for a home-produced fuel, obtainable in sufficient quantities and which can be put on the market and sold at a commercial price. Much has appeared in the press of late concerning the prohibitive prices that have long prevailed for gasoline and there is talk of still higher prices.

The Royal Automobile Club will conduct trials and tests of any new fuel produced, but at the present time, owing to the heavy expenses that it has incurred since taking over its magnicent clubhouse, it is not in a position to bear any financial responsibilities. The chairman therefore suggested that the Society of Motor Manufacturers & Traders might gainfully devote a portion of the profits reaped from the Olympia Automobile show to encourage research and experiments. The Society has announced that it is prepared to offer a prize of $10,500 for a fuel that is produced in Britain. It will, therefore, be interesting to note that at the present time there is in England, apart from the shale industry, which is being pursued with success in Scotland, two separate plants which are producing a suitable spirit from coal mines and which will, in the near future, place on the market a fuel not only suitable for pleasure cars, but also for commercial vehicles at a much cheaper rate than gasoline.

Tests have been made with a paraffin carbureter with a view of ascertaining what results would be achieved when running on the heavier, but cheaper, fuel. A run of 2,000 miles was made with this carbureter fitted to a pleasure car, which covered a great portion of the distance on the road under ordinary conditions, and also a part was run off on the Brooklands track at high speeds, and the results were entirely satisfactory, the spark-plugs being quite clean. In addition to this test, accompanied with bench and speed tests, it was fitted to a 3.5-ton commercial vehicle of 18 horsepower equipped with solid tires for a distance of 1,000 miles, in the course of which neither spark-plugs nor engine were cleaned in any way nor were the valves touched; but all were in perfect order at the end of the test, and the exhaust vaporizer was found to be entirely free from carbon deposit. The great drawback, however, when paraffin is used in the motor, is the unpleasant smell that it creates, and but for this there is no reason why it should not be universally utilized for internal combustion engines.

Then there is benzol. There are many who advocate the use of benzol for cars, but in England there are no more than 2 or 3 firms at most which produce benzol, and what they do produce is mostly sent abroad. When mixed with alcohol not only does it make a fine fuel, from which many declare a greater mileage is obtained, but it is also a very cheap one, for, compared with gasoline, it costs only 24 cents per gallon against 37 cents per gallon now asked for gasoline.

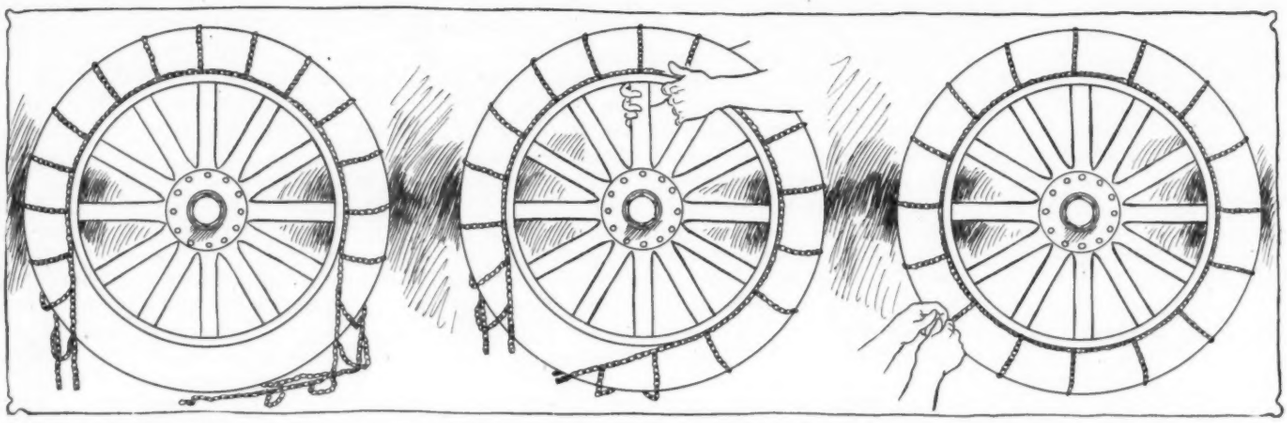

Fig. 1—Three steps in putting on a chain: First, lay chain over tire; second, pull car back over chain; third, fasten catches. This avoids use of jack

Tour from Columbus to Mammoth Cave; Carbonic Gas in Tires; Rating Six-Cylinder Cars; Making Magneto Change; Piston Displacement vs. Horsepower; Leak at Spark-Plugs Cured; Correct Oil for Winter Use

From Columbus to Mammoth Cave

EDITOR THE AUTOMOBILE:—I, with possibly forty to fifty people, expect to go by machine to Mammoth Cave, Ky., from Columbus, O. Could you give me the best route?

Baltimore, O. E. E. HANSBERGER.

THE AUTOMOBILE suggests that you go through the following cities: Indianapolis, Ind., Louisville, Ky., and thence to Mammoth Cave. Starting out from Columbus to Indianapolis via the National Road, you will find a very level country, mostly excellent gravel pikes. The first city between these two points will be Springfield, O., a distance of 43.4 miles. By following the Blue Book route you will pass through the following towns to that city: Alton, 9.4 miles; West Jefferson, 14.4 miles; Lafayette, 21.8 miles; Somerford, 26.5 miles; Vienna, 32.9 miles, and Harmony, 37.5 miles, thence to Springfield. From this point to Donnelsville, 51 miles, crossing the railroad tracks at Forgy station, thence direct through covered bridge, 55.7 miles, through Brandt and Fountaine, Tadmor into Vandalia. From here continue straight ahead through covered bridge to Englewood. Cross the railroad tracks at grade immediately beyond and follow telegraph poles through Arlington, cross railroad track again at National Crossing and second railroad crossing to Lewisburg, 84.4 miles. Keep on the National Road through several prominent four-corners to Gettysburg, 93.3 miles, and straight ahead to Richmond. From here the following towns will be passed through: Cambridge City, Knightstown, Greenfield, thence into Indianapolis. The distance between Indianapolis and Louisville is 123.4 miles. The most direct route is via Seymour, Uniontown, Scottsburg, Vienna, Underwood, Henryville, Memphis, Sellersburg, New Albany into Louisville. From here the first part of the route is over macadam road; the last part being the old State Road, which is rocky and rather poor, a distance of 116.2 miles. Then proceed through Mount Washington, Bardstown, Buffalo, Bear Wallow and thence into Mammoth Cave.

Carbonic Acid for Tires

Editor THE AUTOMOBILE:—I wrote you some time ago in reference to the effects upon tires that are inflated from tank carbonic-acid gas. I am looking for a suitable tank to place in a private garage and the above was recommended to me. Kindly give your views on same.

New York City. A SUBSCRIBER.

—Carbonic-acid gas is very convenient and is cheap. It has the drawback, however, that it escapes from the tire through the pores of the rubber much more quickly than does air. Even air, when it is put in a new tire, will pass through the pores of the rubber much more quickly than it will after several refillings. The reason for this is that the air is made up of a combination of several gases. Those having the largest percentages are oxygen and nitrogen. Oxygen passes through the rubber pores much more rapidly than does nitrogen. As a result, after a time the air remaining in the tire contains a larger and larger percentage of nitrogen and hence remains in the tire for a greater length of time without passing through the pores. Every tire is really a small nitrogen factory. As far as harming the structure of the rubber is concerned, the carbonic-acid gas will do no harm.

Horsepower Rating of Sixes

Editor THE AUTOMOBILE:—A six-cylinder motor, bore 4 inches, stroke 5 inches, with valves in the cylinder heads, is installed in a certain car. The following questions are involved in its installation:

1. What is the A. L. A. M. horsepower rating of a six-cylinder motor of 4-inch bore and 5-inch stroke, it being an L or T-head motor, at 800 revolutions per minute, at 1,000 revolutions per minute, at 1,200 revolutions per minute, at 1,400 revolutions per minute, at 1,500 revolutions per minute, at 1,600 revolutions per minute, at 1,700 revolutions per minute and at 1,800 revolutions per minute?

2. Does a motor with valves in the head of the cylinders, everything otherwise being equal, develop more power than a L or T-head motor, and if so, how much per cent. more?

3. In rating the horsepower of a motor, does the A. L. A. M. take into consideration the stroke of the motor?

4. Does a motor having 1 inch more stroke than bore (4-inch bore) develop more horsepower at certain specified speeds than a motor having no more stroke than bore, everything otherwise being equal, and if so, how much more?

Chicago, Ill. JULIUS STRAPONIUS.

—1. The horsepower rating of six-cylinder motors is shown in the curve at Fig. 2. The A. L. A. M. or S. A. E. horsepower formula is $\frac{D^2N}{2.5}$, where D is the cylinder diameter, N the number of cylinders and 2.5 a constant. With the motor you mention, the formula would work out as 38.4. The actual horsepower developed by such a motor would be greatly in excess of this. The number of revolutions per minute does not enter into the A. L. A. M. formula, which takes a piston speed of 1,000 feet per minute as a basis.

2. This is a mooted question. With the valve in the head, a very advantageous shape of combustion chamber can be secured, and a gain in power has been claimed on this account. This gain has never been reduced to figures.

3. Indirectly. THE AUTOMOBILE has previously published the derivation of this formula, but since it is a matter of common interest, as many states use the formula as a basis of the calculation of horsepower in deciding the license fee, it will bear repetition.

The indicated horsepower of a four-cycle single-cylinder motor is equal to the mean effective pressure P times the area of the piston A, in square inches, times 1-4 the piston speed S in feet per minute and the result is divided by 33,000. The factor 1-4 holds good for the four-cycle motor since the power is only exerted on every fourth stroke or once for every two revolutions. This is expressed in equation form thus: $\text{I.H.P.} = \frac{P \times A \times S}{4 \times 33{,}000}$. Multiplying this by the number of cylinders N of the motor and further taking into consideration E, the mechanical efficiency of the motor, the formula for B.H.P. becomes: $\text{B.H.P.} = \frac{P \times A \times S \times N \times E}{33{,}000 \times 4}$. The A. L. A. M. assumed that the motor will deliver its rated horsepower at a piston speed of 1,000 feet per minute and that the mean effective pressure in the cylinder of the automobile motor will be 90 pounds to the square inch. It also assumed that the mechanical efficiency of the motor will be somewhat in the neighborhood of 75 per cent. and will average that figure. Substituting these values in the formula for brake horsepower and also substituting for A its equivalent, .7854 D^2, the equation reads: $\text{B.H.P.} = \frac{90 \times .7854 D^2 \times 1{,}000 \times N \times .75}{33{,}000 \times 4}$. Performing the indicated operations, the formula is simplified to its final form $\text{B.H.P.} = \frac{D^2N}{2.489}$, or, in round numbers, the denominator may be called 2.5.

4. A motor with 1 inch more stroke than bore will develop more power at all speeds than a motor having the same stroke as bore. In the case of a motor with a 4-inch bore this ratio would theoretically be about 20 per cent. greater.

Making Magneto Change

Editor THE AUTOMOBILE:—I wish to put a Bosch magneto DR4 on my car, which is equipped with a Remy type S. Could Bosch be connected to Remy coil, so I could use batteries for cranking? If not, how would you suggest to do the work? There is no timer on the car and I can use but one set spark-plugs.

Birmingham, Ala. READER.

—The Remy S magneto is of the low-tension type and conducts a current to a non-vibrating coil which creates the high-tension current necessary for the ignition. This magneto has a stationary winding which simplifies the construction, eliminating revolving wires, carbon brushes and all moving contacts—common objectionable features of construction in other magnetos. A single winding of coarse magnet wire is imbedded in the pole pieces of the magneto. The rotative part or inductor is a solid steel shaft upon which are mounted two simple forgings or inductor wings, one on either side of the winding. At each half turn of the inductor, the direction of the flow of the lines of magnetic force through the winding is alternately reversed, inducing in the winding two electrical current waves or impulses for each complete revolution.

The stationary winding is directly connected through the magneto circuit breaker with the primary of the non-vibrating step-up transformer coil used with the magneto. The circuit is mechanically broken during the current wave which is of considerable duration (over 45 degrees of the inductor's revolution). The nature of the wave, due to careful design, is an almost abrupt rise and fall with a flat top, making possible the large timing range for advance and retard of spark at practically the same heat of spark. The timing of the spark is accomplished by shifting the circuit breaker around the inductor shaft, to which is attached the circuit-breaker cam.

The distributer of the magneto and its 2:1 driving gear for the four-cylinder motor is for the purpose of distributing the current after it has been sent to the coil and transformed to the high voltage which it is necessary to use at the spark-plugs. It will be noted that the one high-tension cable leads from the coil to the distributer. For each revolution of the magneto inductor, this cable carries two high-voltage current impulses to the distributer, and as the fan-shaped distributer segment is making one revolution to two of the magneto inductor, it can in turn deliver a

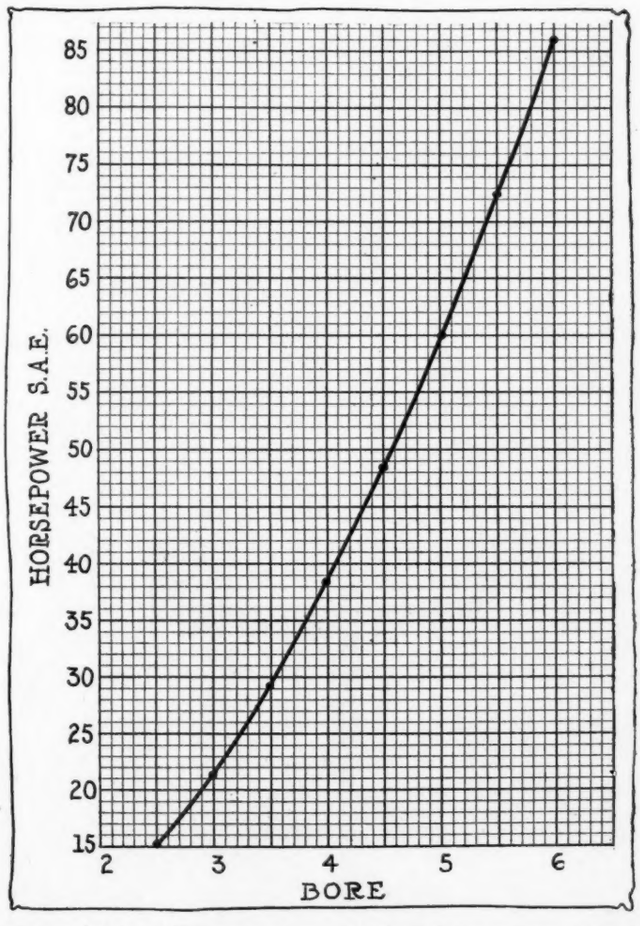

Fig. 2—S. A. E. horsepower curve for six-cylinder motors of bores between 2.5 and 6 inches

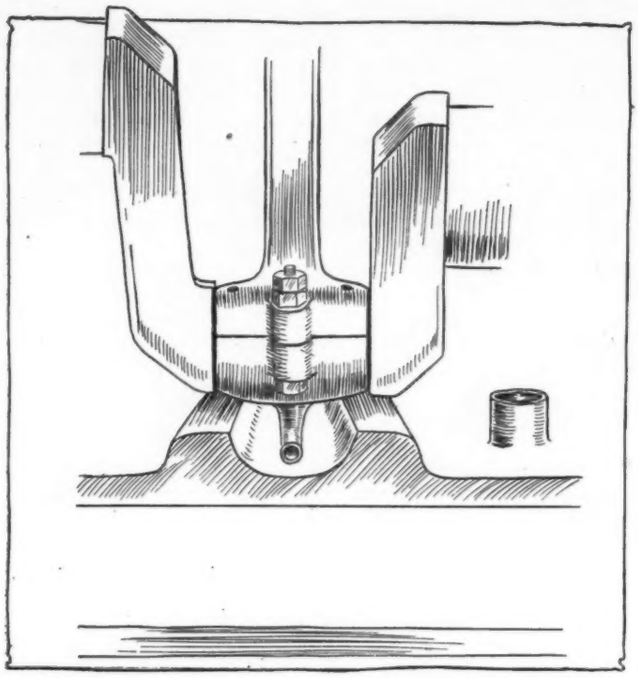

Fig. 3—Scoop on bottom of connecting-rod, illustrating splash system

spark to each of the four cables leading from the distributer to the spark-plugs each time the magneto inductor makes two complete revolutions.

The magneto inductor must, therefore, with the four-cylinder, four-cycle engine, always be driven at twice the speed of the engine camshaft or the same speed as the crankshaft. With the six-cylinder, four-cycle engine the magneto distributer is back geared with a ratio of 1:3 and the magneto must be driven at three times the speed of the camshaft or one and one-half times the speed of the crankshaft.

With the two-cylinder, four-cycle opposed engine the magneto does not have a distributer and a single cam is furnished on the magneto, causing but one electrical impulse for each revolution of the magneto inductor. The magneto must then be driven at the same speed as the crankshaft of engine.

The special step-up transformer coil furnished with the magneto is fitted with a two-point switch used to switch from battery to the magneto or *vice versa*, or disconnect from either to stop the motor. The switch is also provided with a push button for the purpose of starting the four-cylinder or six-cylinder motor from the spark by pushing the button when the switch lever is turned to the battery side. This system makes starting without

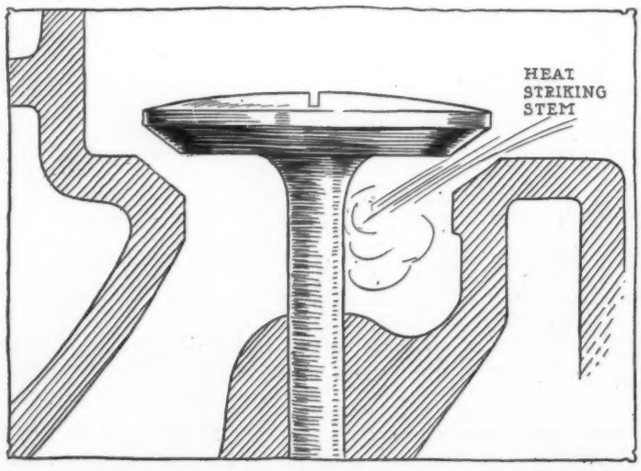

Fig. 4—Where the heat strikes the valve stem in exhausting

cranking most reliable, for the reason that the coil is particularly suited to the magneto which is not injured by large current consumption, as would be the case were batteries regularly used. When the battery is in use with the coil, it furnishes then an exceptionally hot spark. When the battery is used, it will be understood that the battery current is simply turned through the coil and distributer of magneto instead of the magneto current. It is intended that batteries be used for starting and relay, although the magneto is regularly used for starting.

The Bosch DR4 magneto is of the high-tension type and therefore it is not necessary to use a high-tension coil. The connections between the two units of the Remy system are such that the Remy coil would not even be applicable to the low-tension magneto. This is true of any of the low-tension magnetos which has been specially designed for a certain coil. No other coil would be suitably substituted.

Piston Displacement Vs. Horsepower

Editor THE AUTOMOBILE:—Will you kindly advise me if a square cylinder and one with a small bore and long stroke, both having the same amount of cubic inches, would have any difference in power.

Syracuse, N. Y. HOWARD K. BROWN.

—The motor having the greater number of cubic inches of piston displacement per minute would have the greater horsepower. In other words, it would largely be a matter of rotative speed. So many factors enter in which qualify this statement, however, that it cannot be given as any more than a general rule. The valve sizes affect the power to a large extent and the stroke-bore ratio must not be extreme. It would be possible to have a long cylinder of a stroke-bore ratio of such size that it would be impossible to secure good efficiency. For every bore and every piston displacement there is one stroke-bore ratio which would develop the greatest power when all other conditions are the same and hence it is impossible to give a fixed and definite answer to your question.

Has Leaky Spark-Plug

Editor THE AUTOMOBILE:—How can I stop a leak from my pet-cock on the engine of an Oakland 30? One of my spark-plugs leaks also.

2. When I put my machine in garage for the winter I dropped kerosene and cylinder oil in the engine. Will it be dangerous to start the motor in the spring?

Portland, Maine. P. E. BALDWIN.

—1. If you will dip the threads of the pet-cock in shellac of a fairly thick consistency and place a copper-asbestos gasket beneath the shoulder of the cock and screw it in, the leak will be stopped. If there is no shoulder leave out the gasket. Leaky spark-plugs often occur because a plug with sufficient shoulder width is not purchased. The standard A. L. A. M. spark-plug thread is a straight thread and needs a shoulder and a gasket to hold it against leakage. The other threads were taper fits and did not need the gasket. The effect of the gasket and shoulder is brought out in Fig. 6.

2. No, it will be difficult.

Connecting-Rods in Oiling Systems

Editor THE AUTOMOBILE:—On my care I have a force-feed oil system which I wish to change to the splash system. I can secure a crankcase which will adapt itself to my motor perfectly and I would like to know if it is necessary to redesign any of the bearings or the connecting-rods in order to take care of the change. Would you kindly explain to me the difference in the internal features of a splash and force-feed system in Letters Answered and Discussed?

2. What is the best way to put on tire chains quickly, without jacking the car?

New York City. CHARLES PEINE.

—Differences between the connecting-rods and crankshafts in

the splash and force-feed systems are shown in Figs. 3 and 5. A small part of the crankcase is also shown. It would not be advisable to fit a splash feed on a car that is already equipped with force feed. The force feed should give satisfaction as long as the oil pump is in working order, and these are so simple that it is hardly possible that the pump on your car is out of order permanently. The only difference between the connecting-rods in the splash and the force-feed systems is that the splash connecting-rods generally have scoops to take up the oil.

2. The three steps necessary in putting on a tire chain without jacking up the wheels are shown in Fig. 1. It is important to straighten out the chain thoroughly.

Where Heat Strikes Valve Stem

Editor THE AUTOMOBILE:—Would you kindly tell me why it is necessary to select a particular material for a valve stem, when the head is the only part exposed to the heat?

Boston, Mass. H. W. PERRY.

—The heat strikes the valve stem even more effectively than the head, because it strikes it in one particular point. Therefore it is necessary to select a material that will stand up under heat which is more severe at one point than another.

Stopping Leaks in Spark-Plugs

Editor THE AUTOMOBILE:—Will you kindly inform me as to how I can stop an air leak in one of my spark-plugs? I have a Ford machine and the defect must be at the thread of the spark-plug hole in cylinder head, because of having tried a half dozen new plugs already, screwed down as close as possible, without getting any better results whatever. Is there anything that can be used on the threads to stop this leakage without causing trouble whenever it becomes necessary to take the plug out again? Would it be an advantage to have the spark-plug gaps opened less than .03 inch with the Ford magneto?

Easton, Pa. WILLIAM F. BECK.

—Referring to Fig. 6 it will be seen that a plug with a shoulder will often stop a leak. If the plug is dipped in thick white shellac before being screwed to the cylinder it will probabaly hold against leakage. The spark-plug used on the Ford car is the .5 inch, straight-thread type. Where the taper-thread spark-plug is used the threads are jammed together on account of the wedge action. Where the straight thread is used it is necessary to guard against leakage by the use of shellac or adequate gasket protection. The maximum a spark-plug gap should be open is .03 inch with the Ford magneto. It would be of no advantage to make it less and it would be bad to make it greater.

Increasing the Motor Power

Editor THE AUTOMOBILE:—In your issue of January 2, page 45, there is an article on a compressed-air motor booster, and in reading this, I thought it might be possible to increase the power of a two-cylinder, opposed motor by admitting the gas mixture into the crankcase and discharging the gas mixture into the cylinder when greater power is desired.

It seems to me that this could be accomplished by having a three-way valve arranged in the intake so that for ordinary running the engine would receive its gas in the ordinary way by suction, and when increased power is desired, the gas could be admitted into the crankcase, which would super-charge the cylinder to a considerable degree since we have the displacement of both cylinders for one charge of gas to each cylinder.

I have a two-cylinder Maxwell, and for some time have thought of making such a change in the intake as an experiment, but have feared that it might interfere with the proper working of the engine and for that reason have hesitated to do so.

Grafton, W. Va. R. H. P.

—It must be remembered that the compression of the crankcase on an average motor is only about 3 or 4 pounds. The expansion required to bring the gas from the crankcase into the cylinder would be enough to reduce the compression to a large extent and would therefore result in a very slight increase of power. There is no doubt but that the use of a fuel compressor which would inject the mixture under high pressure into the cylinder would increase the power. The only trouble is the greatly increased complication in the high cost of manufacturing a system which would contain the high pressures without leakage. In other words, it would be cheaper to increase the power by buying a larger engine.

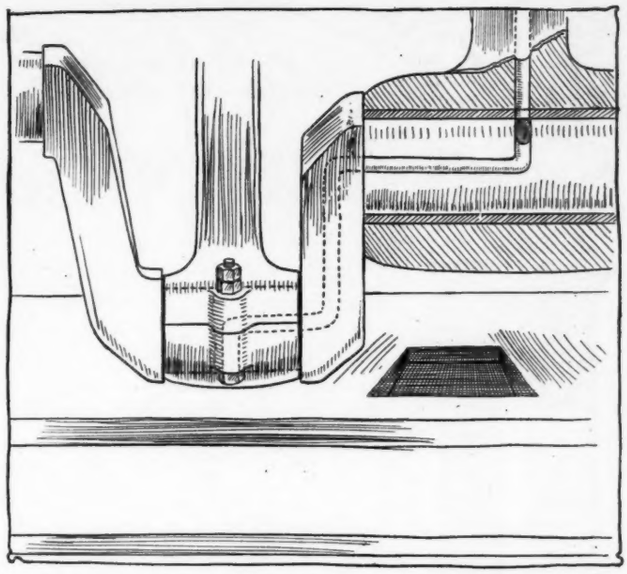

Fig. 5—Non-splash system with screen through which oil may drain

Correct Oil for Winter Use

Editor THE AUTOMOBILE:—Would you please write and let me know what is the best oil to use in cold weather in the Continental motor. It does not seem to have the full strength after running for a half day. Would you blame it on the upper gasoline tank? It runs fine for a half day and then loses its power.

Philadelphia, Pa. WALTER SCHOEN.

—Use a light medium cylinder oil and keep the front of the radiator covered. The motor cannot work efficiently if it is cooled to too great an extent. The cooling system is designed to take care of the car on warm summer days. When the cold winds strike the radiator, they cool the water to such an extent that the motor runs much cooler. The heat which should be turned into power is allowed to escape through the radiator. It may seem strange that power losses should occur from such a cause, but it is nevertheless strictly true. The radiator area necessary on a cold winter day will probably be one-half that required in warmer weather.

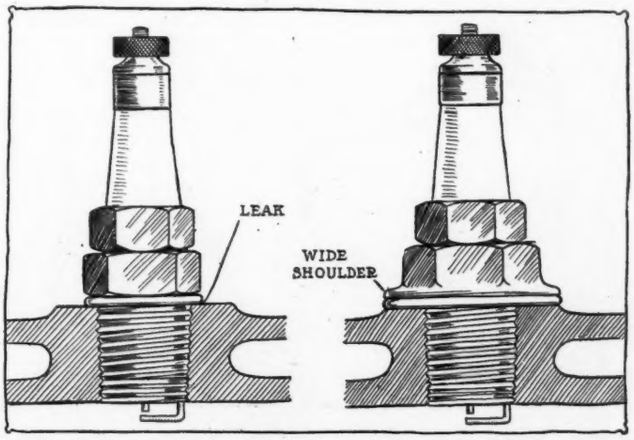

Fig. 6—How leaks may occur around narrow-shouldered plugs

European Patents

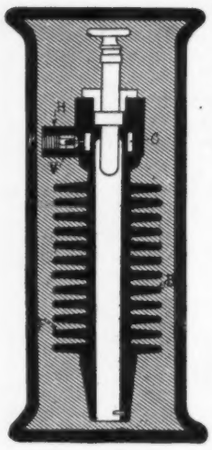

Fig. 1—Harpst plug and intake valve

INTERESTING inventions of various natures have been granted European patents during the last few months, and among these the number of engine designs embodying noteworthy ideas is striking. The invention along this line has concentrated largely as before in the production of silent motors, and, while the means for obtaining silence are in many cases akin to the principles involved in present designs, some meritorious improvements have been made, which bid fair to increase silence of operation and general efficiency of the mechanisms.

The prominence of sleeve valves is shown by the designs illustrated in Figs. 2 and 3. Fig. 2 illustrates a Renault design, covered by British patent No. 15,825. This patent involves the use of a reciprocating sleeve inside the cylinder and among the noteworthy features is the manner of obtaining a gas-tight joint between the valve, the cylinder and the dead space in the head. The sleeve-valve S which fits into the engine cylinder is shaped at its upper end with a flange seating on the beveled face H of the cylinder head. The sleeve valve is formed with horizontal ports operating in the conventional manner. The valve itself is actuated by the reciprocation of a walking beam one end of which is pivoted at P to the crankcase, while the other end is lifted periodically by the eccentric portion of the cam C. The follower always remains in contact with the cam, due to the tension of a spring S2.

Fig. 3 shows the engine design of Johnson, Hurley and Martin, covered by patent No. 15,298. The sleeve idea has been combined with that of the piston valve by fitting the sleeve to the periphery of the working face of the piston P1. This has been done to fill the requirements of the two-cycle engine here shown. The mixture compressed in the crankcase travels thence through a passage to the inlet port I which opens into the combustion chamber when the port P1 on the sleeve extension of the piston registers with it. Likewise, port P in the piston is provided to register with the exhaust port E in the engine cylinder.

Another Renault design is shown in Fig. 10, illustrating the subject matter of patent No. 15,907. The principal difference between this design and that shown in Fig. 2 is that the valve seats against a vertically inclined face formed on the cylinder head. The valve is shown at S and its seat at S1. This provides possibility of scavenging the combustion chamber almost perfectly, by placing the exhaust port E of the cylinder at the level shown in Fig. 10. The exhaust port in the sleeve is formed in its top section, and to provide perfect seating of the valve S, it is formed with a shoulder S2 subject to the pressure in the cylinder whereby it is held against the wall of the latter. Fresh gas is admitted through a pocket valve in the center of the head.

A rotary valve described in the British patent No. 14,944 is shown in Fig. 11. This valve design is the invention of G. Fornaca, of Turin, Italy. The rotary valve R is made with closed ends and its interior is kept in communication with the combustion chamber to a central port C, or through a pair of ports P and P1 which are formed near the valve ends. The valve is supported by a spindle S carried on bearings in partitions Q between adjacent cylinders. The valves serving various cylinders are not in communication but are carried on the same spindle. The explosion pressure holds the valve tightly against its casing.

A peculiar valve idea is shown in Fig. 6 which illustrates the Behrend patent No. 11,643. The valve V is held in position in the horizontal face of the piston which is equipped with such extensions that an upper and a lower seat for respective faces on the valve V are provided. The valve is weighted and if lifted off the seat S provides a passage between the crank or compression chamber and the combustion chamber. Operation of the valve is by the combined effects of the pressure in the crankcase and the cylinder, and the momentum of the valve itself.

Fig. 17 shows the engine described in Harveng's patent No. 13,565. This patent provides an annular reservoir around the inner port and close to the charging pump. The reservoir R is divided by a horizontal plate and is charged with air from the pump space P. Part of the charge enters the cylinder through the valve V, passing into C, while the rest of the charge passes through P1 to the chamber C1. The distribution of the charge in the cylinder is controlled by a sleeve formed as a vertical extension on the face of the piston. The mixture enters the cylinder after having been compressed in the crankcase, and after the combustion chamber has been scavenged by air entering through P2. The mixture is formed in the chamber C whence it is sprayed through jets J.

The two-cycle engine design shown in Fig. 9 includes the use of a rotary valve and a system of passages for conveying the gases to the cylinder and out of the same. In the case of fresh gases the mixture is drawn into the front end of the cylinder C at the end of each upstroke. It enters through a passage P in the piston through inlets passages I and I1 and a pipe P1 in which a rotary valve V is formed. This valve pro-

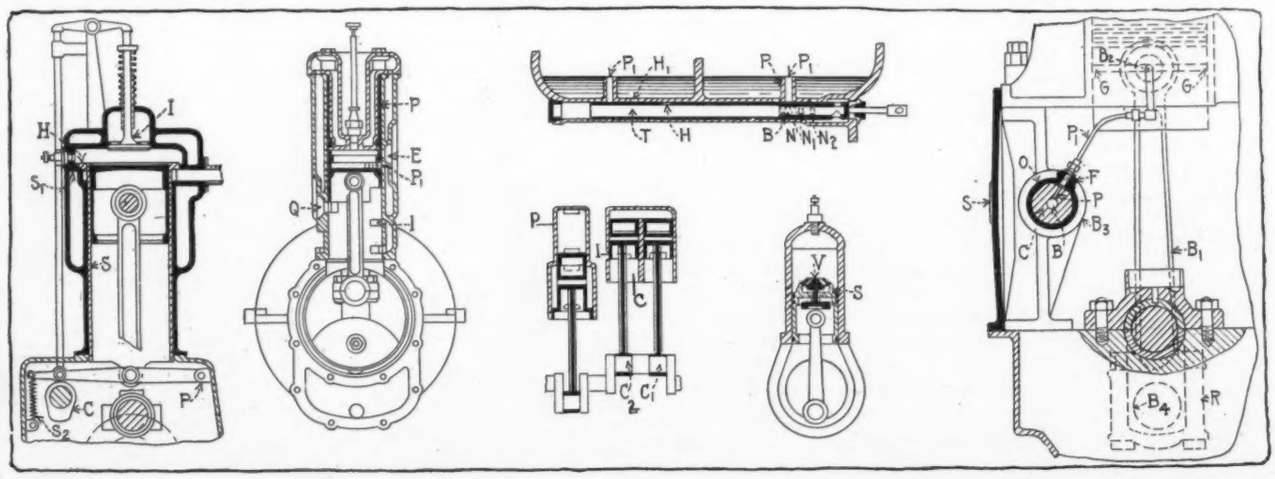

Fig. 2—Renault sleeve-valve motor. Fig. 3—Johnson two-cycle sleeve motor. Fig. 4—Peugeot lubricating system. Fig. 5—Albion twin-cylinder engine. Fig. 6—Behrend piston-carried valve scheme. Fig. 7—Russett lubrication

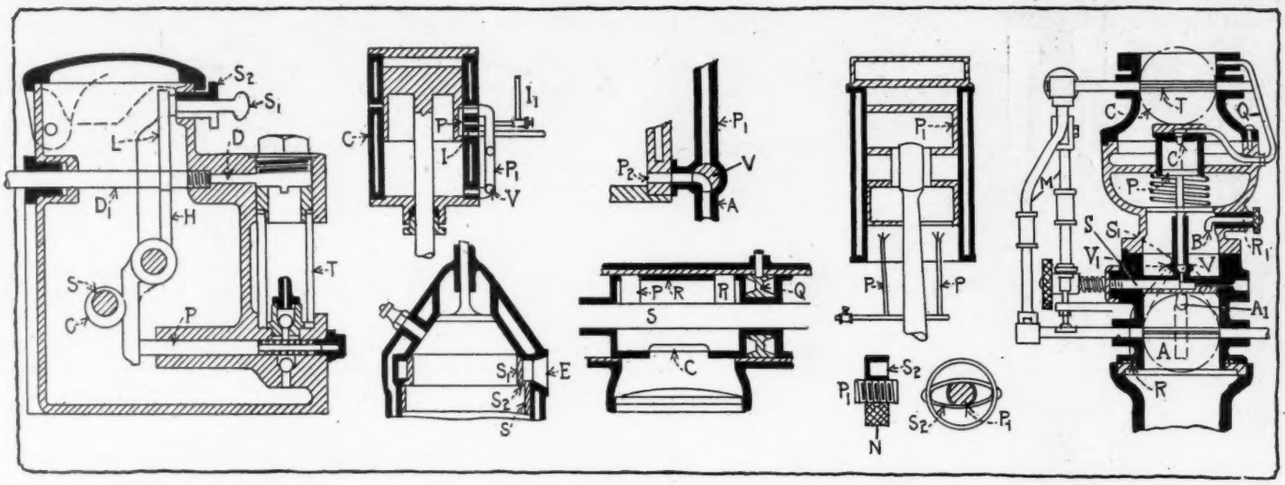

Fig. 8—Morris & Bunch oiling system. Fig. 9—Two-cycle engine valve. Fig. 10—Renault sleeve-valve improvement. Fig. 11—Fornaca rotary valve. Fig. 12—Daimler-Diesel motor improvement. Fig. 13—Weiss carbureter

vides a communication through pipes P1 and P2 when suitably positioned and also makes possible the admission of compressed air for starting the engine.

The German Daimler Company is interested in the Diesel principle, as is evidenced by the design shown in Fig. 12, which illustrates the British patent No. 14,598. In this patent the surplus of the compressed air which is used for injecting liquid fuel into the cylinders is utilized for cooling the piston P1 instead of blowing to waste, the air issuing from pipes P.

British patent No. 13,915 describes a two-cycle design patented by the Albion Motor Car Company. The idea which has been put into practice in this design is the use of one combustion chamber in common by two cylinders, the pistons of which are formed independent of one another but work on the throws C1 and C2 a common crank pin. The charge enters the combustion chamber of the double cylinder C through the inlet port I, Fig. 5, after having been compressed by the pump P which is accurated by a plunger set at an angle of 180 degrees to the connecting rods of the engine. No mention is made of special valves or valve gears in this patent.

Fig. 4 illustrates a patent taken out by the Peugeot company on a system of engine lubrication; the number of the patent is 12,487. The patent refers to a device for draining the oil from the crankcase either entirely or to the level of an overflow pipe. This object is realized by the use of the horizontal tube T sliding in another tube O, which is formed at the bottom of the crankcase. The tube B is formed with holes H registering either with holes H1 in the crankcase casting or with overflow pipes P which divides the crankcase into compartments, being formed on partitions P1. In the position shown in Fig. 4 H1 and P are shut and the oil flows through T to a chamber C provided with a stopper conduit whence the oil may be drained. The tube T is actuated by a lever and is prevented from rotation, being locked in any one of its three positions by a spring-pressed ball B which engages the notches N, N1 and N2.

Another patent referring to lubrication is shown in Fig. 8, being No. 13,382 granted to Morris & Bunch. This force-feed lubricator is composed of a number of pumps P formed in an oil reservoir, which force oil through sight-tubes T to delivery passages D. Tubes T contain water. Delivery pipes D1 pass through the reservoir emerging at the opposite side. The pumps are actuated by levers H driven by cams C on a shaft S. A variable stroke is provided by stops S1 adjustable by sleeves S2 which engage the extensions of levers L; the latter are hooked at H so that they may be placed over the delivery pipes D1.

In Fig. 7 the Russett system of crankshaft lubrication is shown, being the subject matter of patent No. 12,874. The oil is supplied to the various bearings by way of passages communicating with a bore in a rotating shaft other than a crankshaft; the camshaft may be used for this purpose. This is the case in the design shown in Fig. 7, camshaft C having a central bore B and a radial passage P communicating with a feed pipe P1 through which the oil is forced to the bearings. A flat F connects the bore B and the passage P1. Oils flows through O in the bearing B3 to an oil-box on the crankshaft bearing B1 as well as through a pipe P1 to an annular groove G in the cylinder wall, whereby the piston is lubricated. This groove communicates with the bore B2 in the gudgeon pin. From other orifices the oil is sprayed to a sight window S and into a cup formed on a connecting rod R, which communicates with a bearing B4.

The patents referring to carburetion are likewise numerous. Fig. 13 shows a carbureter, described in patent No. 15,419, in which the inlet ports of fuel and of air are so connected as to work simultaneously. The primary air valve A, the butterfly T and the fuel valve spindle S are connected by the mechanism M. When the butterfly T is closed there is an annular space between it and the casing C. The passage of fuel is regulated by a valve V seating at V1 and connected through a piston P which is actuated by the engine suction. The suction is transmitted from the space above the butterfly through a pipe Q in which a check valve C1 is in place, which protects the valve V against backfiring. Shots S1 and V1 are provided to form fuel jets which carburet the air emerging from nozzles A1. The supply of air to the latter is regulated

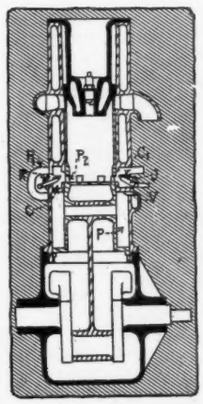

Fig. 17—Harveng engine

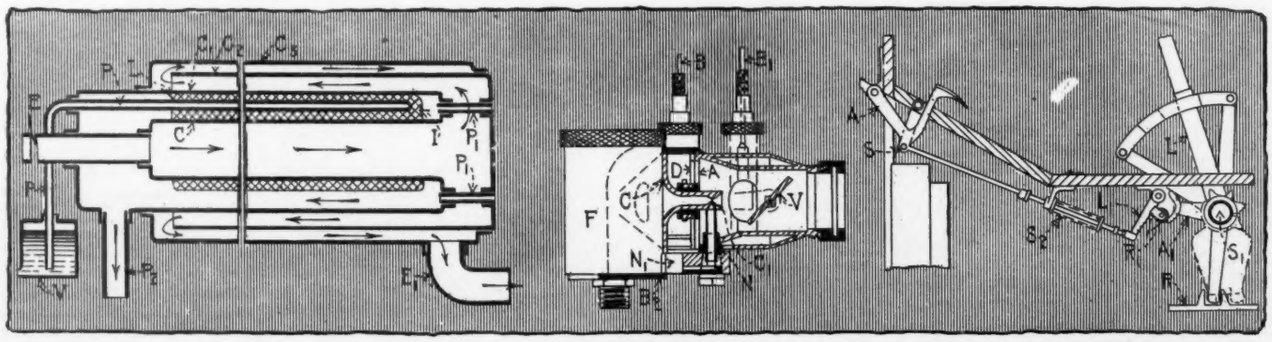

Fig. 14—Constantinescu carbureter and muffler. Fig. 15—Pugh & Bull carbureter. Fig. 16—Daimler accelerator-lever lock

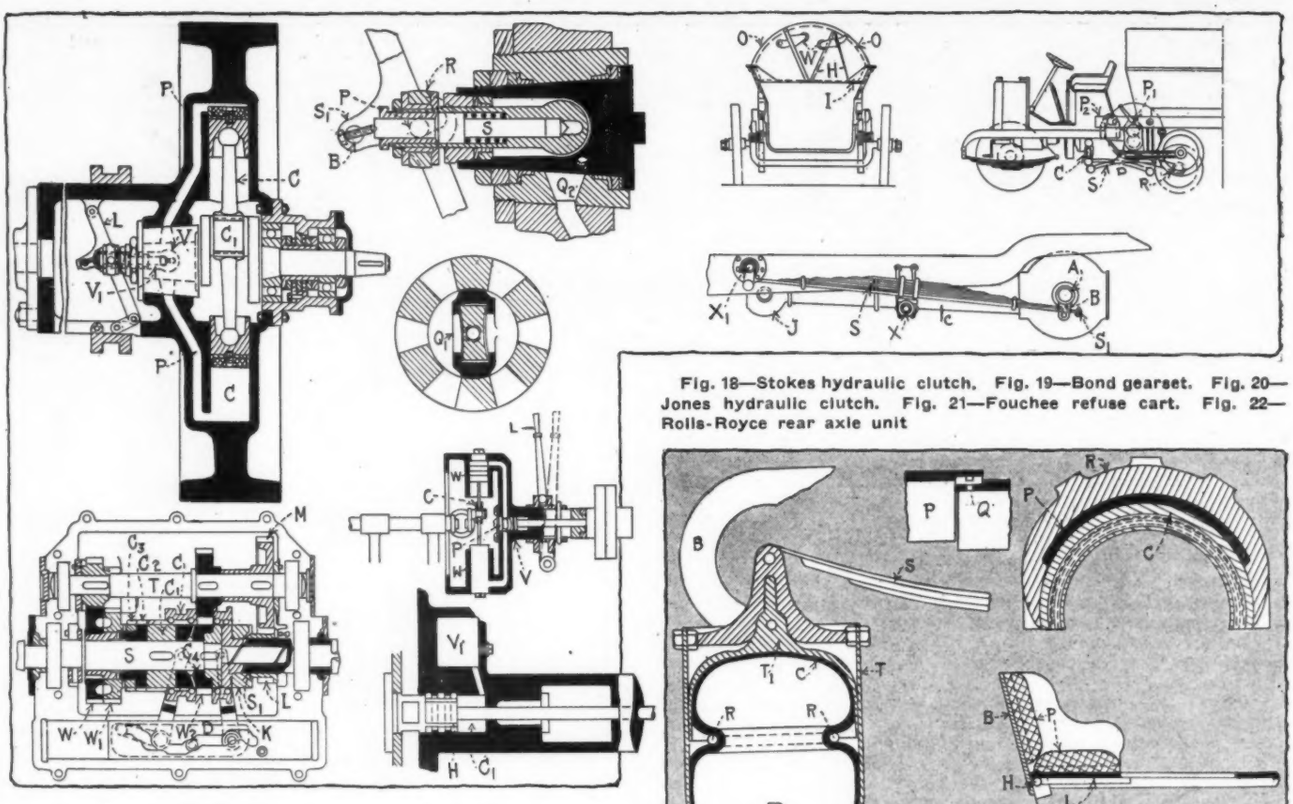

Fig. 18—Stokes hydraulic clutch. Fig. 19—Bond gearset. Fig. 20—Jones hydraulic clutch. Fig. 21—Fouchee refuse cart. Fig. 22—Rolls-Royce rear axle unit

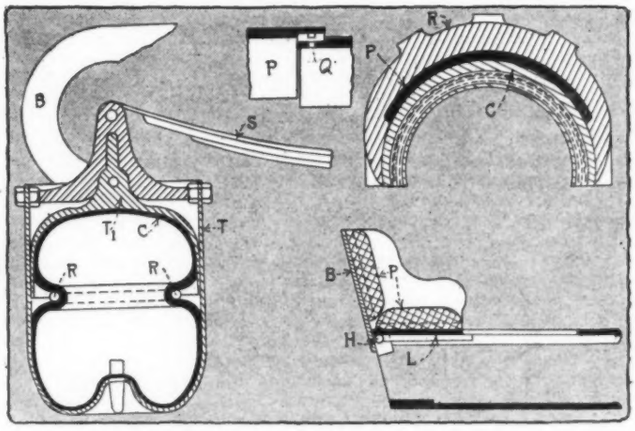

Fig. 23—Spyker pneumatic shackle. Fig. 24—Harris tire reinforced by metal plates. Fig. 25—Radford automobile seat

by air valve A. Priming is effected by turning the nut formed on the end of the rod R1, whereby a spring-pressed plate which holds V to its seat is raised.

The carbureter shown in Fig. 15 is the subject matter of British patent No. 14,805. The nozzle end extends into a contracted portion C1 of the cone C through which air is drawn into a chamber formed between a flow chamber F and the enclosing walls of the carbureter casing. This air serves only for spraying of the fuel whereas the air used for combustion enters through openings O; the latter is controlled by a ported diaphragm D actuated by a Bowden mechanism B. A throttle valve V and Bowden mechanism B1 control the admission of mixture to the motor. The flow of fuel is regulated by a float positioned in a float-chamber F which is carried on a slotted bracket B2 and is fitted with a block N1 supporting the nozzle N.

The Daimler Motoren Gesellschaft, in patent No. 12,645, describes a device for locking the accelerator lever automatically, when certain higher speeds are engaged. This is accomplished by the arrangement of the accelerator lever A, Fig. 16, and the stop S which latter comes in operation only when the speed-changing lever L actually puts the gears mentioned in operating position. When L is moved along the spindle to select the operating rod R for the third or fourth speed, arm A1 comes into alignment with roller R1; the latter is carried by a lever L1 connected to the stop S. The end of A1 forces S into its operative position when the lever L is turned about its axis S1 to engage either of the speeds above mentioned. Ordinarily the stop is held inoperatively by a spring S2.

A carbureter which at the same time acts as a muffler is the design of G Constantinescu, described in patent No. 12,759. The construction involves four concentric cylinders C, C1, C2 and C3, which serve as a passage for the hot exhaust gases entering at E and leaving at E1, the flow of these gases being indicated by arrows. The fuel is carried in a vessel V from which a pipe P leads to a higher portion contained within the exhaust heated carbureter, being supplied to a layer I of incombustible, heat-conducting material. There it meets air entering through P1 and after having been mixed with it leaves through P2. On its way to the engine the mixture may be diluted with further air.

Combining the office of a spark-plug with that of an intake valve the subject matter of Fig. 1 deserves special mention. The invention is that of F. E. Harpst and is described in the British patent No. 11,811. The spark-plug proper is shaped with a shell ending in a conical extension lifting into the cylinder head. This shell is formed with cooling ribs or fins R and inside of the shell a chamber C is provided which surrounds the insulated sparking electrode. This chamber has a lateral pipe extension P which serves as an intake opening and communicates with the cylinder space through the central ball of the plug. Fitted into this pipe is a check-valve opening into the chamber C through which fresh gases are omitted when the piston is on its suction stroke and which is closed by the compression in the cylinder as the piston returns on its upward travel. The incoming charge passes over the inner walls of the shell and cools it, thereby assisting the action of the fins R.

A hydraulic clutch idea which is rather interesting is illustrated in Fig. 18. The clutch is the invention of R. O. Stokes, and is described in detail in patent No. 11,561. Fig. 18 shows the details of construction including the cylinders C which are formed in the flywheel and through which the fluid is pumped, which is circulated to form a connecting unit between power plant and driving set. A system of ports and valves is used to control the flow of the fluid throughout the system; the ports P lead to the central valve chamber formed in alignment with the center around which the crank C1 revolves, which chamber is divided by a plate secured to the crank. In this plate works the outer valve member V which controls the flow of fluid through the port Q1. The inner valve member V1 controls the passage Q2 through the member V. It is operated by a lever L and the spring S which tends to hold it in a certain normal position. A pin P connects the lever to the member V, this pin being carried by a trunnion ring R. The pin works in a slot affording sufficient lost motion to permit of independent movement of the inner valve member V1.

Fig. 20 shows another hydraulic clutch construction invented by T. G. Jones and described in patent No. 12,707. Attached to the shaft of the motor is a crank on which bear the oppositely mounted connecting rods of two pistons adapted to work in cylinders W. The interiors of the latter communicate through a passage P, the cross section of which is variable of a valve V operable by a lever L. The casting of which the two cylinders are parts is mounted on the driven shaft which actuates the differential. The method in which this mechanism operates is as follows: If the valve is in such a position that it closes the passage entirely, the pistons are locked in their relative positions and the driven shaft on which the cylinders are mounted is in direct gear with the driving shaft. If the valve is fully open the crank C revolves around the crankshaft and actuates the two pump cylinders W passing the actuating fluid alternately

from one to the other so that the driven member which is mounted on a driven shaft remains stationary. Partial opening of the valve gives a variety of speeds.

Fig. 19 shows a transmission idea described in patent No. 15,911 being the invention of E. S. Bond. A clutch member C carries several circles of balls and is adapted to engage a tooth wheel. These balls may be brought into engagement with parallel grooves in cylinders C1, C2, C3 and C4 surrounding the driven shaft S of the gearset. C1 is secured to S while the other members are fastened to the bosses of gear wheels W, W1 and W2, respectively. Positive engagement between the member C1 and any of the other three may be obtained.

In Fig. 21 a refuse cart construction is illustrated which is described in patent No. 14,117. The airtight cart is coupled to the tractor by a set of double pins. The rear wheels are supported on stud axles which are carried by the arms A pivoted at P. Springs S are attached below the arms A and at their other ends by screw connectors C. To connect the tractor to a two-wheeled cart the latter is brought close to it and coupled by pins P1 or P 2, after which connectors C are unscrewed until the second set of pins may be put in place, while further unlifting raises the wheels of the cart off the ground. Charging openings O are provided in the top of the cart and a hopper is formed by an inclined plate I and a hinged panel H which is normally kept closed by a counterweight W.

An interesting form of spring suspension is shown in Fig. 22. The live axle casing A is rigidly connected to a casing C pivoted to the chassis frame on a joint J and acting as a radius rod. The side spring S is pivoted at X and X1, having its rear end sliding in a bracket B on the casing A. The stop S1 keeps the spring end from leaving the chassis frame in case of rupture of the casing C. Patent No. 13,516 describes this invention in detail, the patentees being F. H. Royce and Rolls-Royce Ltd.

Another invention referring to the subject of suspension is described in patent No. 14,757 of J. Spyker. The subject matter is a compensating shackle, Fig. 23, consisting in principle of a pneumatic bag inclosed in a casing which consists of two telescoping members T and T1, one of which is fixed to the master leaf of the spring S and the other to the end of the spring reach B. The pneumatic casing C1 is held together in the middle by a ring R which may be supplanted by an annular projection of the internal diameter of the casing part T.

Among the many interesting inventions pertaining to tire design and manufacture is the tire shown in Fig. 24. The outer casing is reinforced by the insertion of metal plates extending transversely through it, being laid over the fabric and under the rubber tread. Individual metal plates P thus form a ring over the tire fabric, being attached to one another by means of studs and holes shown at Q. This puncture-proof tire is the invention of A. R. Harris and the patent is No. 15,353.

Improved automobile seats are the subject matter of patent No. 15,735, granted to W. Radford. The seat described in this patent is really a rumble seat which is formed by the cover of a box carried behind the runabout seats. The member B, Fig. 25, is hinged at H and forms the back of the seat, a loose member L forming the seat proper. These two parts are padded at P and each is formed with an arm rest A. Fastening members engage the rear portion of B when the seat is not in use, whereas otherwise the front end of L is held by them.

Fig. 26 shows a constructional detail of the tire described in patent No. 11,666, the invention being that of T. Gare. The rubber body R of the tire is vulcanized to the metal base M, a layer of vulcanite being in place between R and M. To increase the adhesion between R and M the vulcanite is formed with a serrated or similarly irregular surface S.

British patent No. 15,019 deals with a spring tire construction shown in Fig. 27. The tread T is secured by latteral bands B to outer rims O which are in turn connected to the inner rim I fitting around the wheel felloe. A web W projects from the rim I into the space formed between tire tread and bands B, and between this web and the bands a series of helical springs H are in place which tend to hold the bands in properly spaced relation from the web and are adapted to absorb shocks, etc., imparted to the tire rolling over the road. G. Racca and G. Dall'Oglio are the inventors of this tire.

M. Wolff, in patent No. 15,144, describes a detachable rim attachment shown in Fig. 28. Each rim is formed with a projecting flange F protecting securing bolts and similar member if a single rim is used on the wheel, while in case of dual rims the flanges serve as facing rims as in the illustration here shown. Interengaging lugs are arranged on the fixed and detachable rim members and, in the dual form of rim the valve stems V are arranged at the side of the felloe and not through the same as in ordinary practice.

A spring tire which offers possibilities is described in patent No. 15,319, having been granted to R. Rhone. It comprises a continuous tire T having beaded edges, with ends joined by a metal shoe M, Fig. 29. The latter is guided by a side-plate P supported by helical springs which are contained in recesses formed by transverse webs W. A plate Q forms a bearing between each spring and the tire, and a rod R on each plate Q engages notches in the helical spring above which it is in place.

A tire valve cover, Fig. 30, is the subject matter of patent No. 12,943, the inventor being W. G. Nelson. The covers for the security bolt and valve stems comprise a hollow, close-ended nut N which carries a rotatable sleeve S fitted with a rubber washer W. Movement of the sleeve on the nut is prevented by a collar on the nut which engages ribs and grooves G on sleeve and nut. The formation of the part P is such as to permit of easy application of a spanner.

British patent No. 15,415 deals with the peculiar tire design shown in Fig. 31. The casing is formed with a centrally and internally extending tongue T which fits between the sides of a groove G.

Engine-worked tire inflation is the object of the invention illustrated in Fig. 32 which is described in patent No. 12,085. The Beorchia scheme provides a friction wheel W actuated by the flywheel and suspended on an arm R. The shaft on which the wheel is mounted has an eccentric carrying a connecting rod bearing, and the connecting rod is connected by a joint J to the plunger which carries the pump piston.

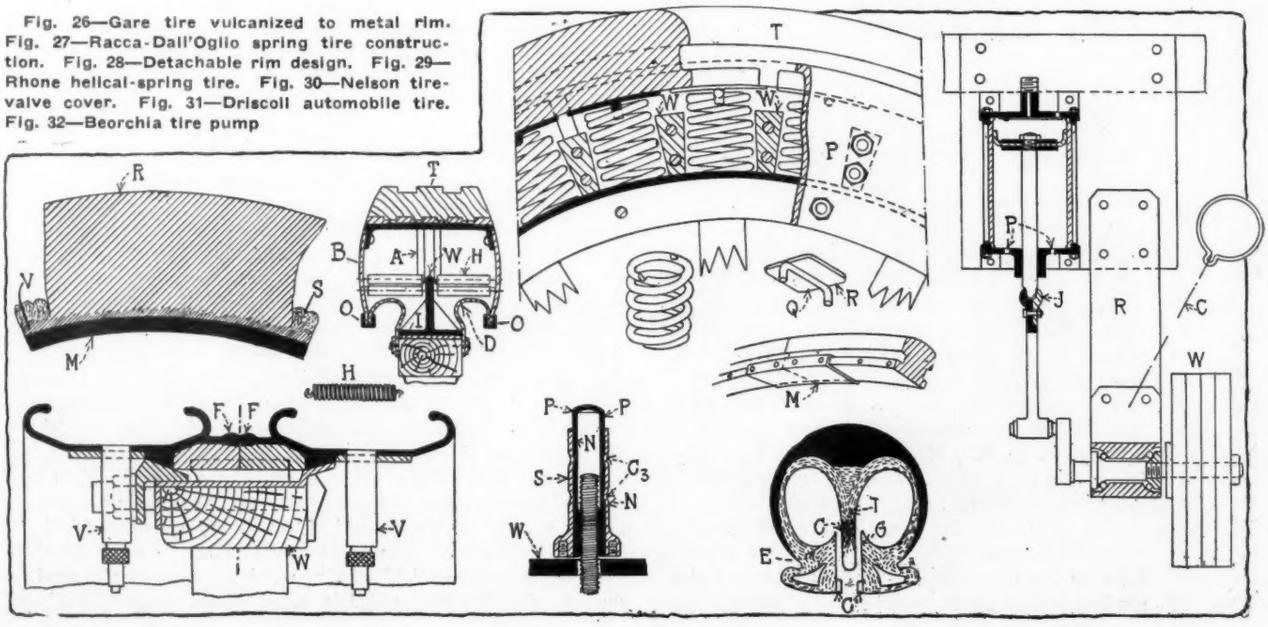

Fig. 26—Gare tire vulcanized to metal rim. Fig. 27—Racca-Dall'Oglio spring tire construction. Fig. 28—Detachable rim design. Fig. 29—Rhone helical-spring tire. Fig. 30—Nelson tire-valve cover. Fig. 31—Driscoll automobile tire. Fig. 32—Beorchia tire pump

Electric Cranking and Lighting

Part II

Taking Up the Electric Systems Now on the Market. In Studying These Systems the Physical Layout Adopted by Each Maker Should Be Noted Along with Details of Design

Subject Digest

¶ Makers of Electric cranking and lighting systems have had a sudden demand thrust upon them. The big question of the New York shows, asked by every intending purchaser of a car priced at more than $1,000 was: "Have you an electric starter?" This demand has caused a flood of designs.

¶ The youth of the electric cranking and lighting industry is shown by the great number of varying designs placed on the market. No two are alike in even the essential details, although making use of the same principles.

¶ Two-unit and three-unit systems are leading the way, although the single-unit system with the ignition and lighting generator and the cranking motor all in one casing are coming into prominence along with the increase in 6-volt systems.

¶ Most of the starters now on the market have been fitted to the car after the car itself was designed. They have been put on as an afterthought. The results in a number of cases, as far as appearance goes, show this. Six months later, the cranking motors will not be as clumsily mounted as many of them are now.

LAST week THE AUTOMOBILE gave in as simple a form as possible the main features of an electric system on an automobile. It was pointed out that there must be three main units. A battery, a generator and a cranking motor to make up a complete ignition, lighting and starting system. These units must possess certain relations to one another and must perform certain functions. The requirements of the units and their relations were fully discussed in that issue and it remains now to touch on the systems which are at present in use.

The youth of the manufacture of electric cranking instruments cannot be better shown than by the great variety of types now on the market, although the same basic principles can be seen in each application. Since this is the first year that the electric cranking motor can be said to have come into its own, it is manifestly impossible to state that there is any trend in the manufacture of these instruments. The equal division between the 6, 12 and 24-volt systems show that the opinion of the designing engineers is at great variance on this subject.

An equal division also may be noted between those who are using the motor and the generator in two separate and distinct units and those who are putting them together in one housing. The advantages of simplicity are argued by both sides as their reason for either making the system in a single or double unit.

One of the noticeable points in the installation of the electric cranking systems is the clumsiness with which they are mounted on the chassis. The reason for it is apparent after a moment's consideration. The starter is the result of a sudden demand and the result has been that they have been installed after the design of the engine and chassis was complete. They have simply been added. The result of this has been in many cases a bad engineering job. The drive has been defective, the appearance anything but satisfying and the result on the whole bad. Even on these installations, however, credit must be given for the ingenuity displayed in applying cranking motors to engines and chassis which were designed and built without the slightest idea of any such installation. There are many which are so designed that they can be applied even after the car is in use.

Gray & Davis—Three-Unit System

The Gray & Davis electric lighting and cranking system belongs to the three-unit class. Two units are furnished by the company, namely, an electric generator and a cranking motor. The third, or ignition unit, is optional with the purchaser and is not supplied by this company.

Both the electric generator and the motor of this system operate at 6 volts. A 6-volt battery is therefore used with this system, its capacity varying with the size of the motor which has to be started and the number of lamps used.

The generator is driven either through gears or by means of a silent chain. The speed of the generator is regulated by means of a centrifugal governor. This governor permits the generator to be driven positively up to 750 revolutions per minute in the case of one size of generator and 1,000 revolutions per minute in the case of another. Above these definite speeds the governor causes the driving clutch to slip, thus maintaining the armature speed very nearly constant.

These critical speeds are reached at a low car speed, so that the generator gives its full output when the car is traveling from 10 to 15 miles per hour, this variation being determined by the gear ratio and size of tires on any machine. The generators are geared 2:1 or 1.5:1 depending on the size used. They are driven either by silent chains or gears.

The regulation of the amperes output is accomplished in two ways on the Gray & Davis generator. The machine is compound-wound, namely, with a shunt field, SHF, and a series field, SEF, Fig. 1. Unlike most compound-wound machines used for electric lighting, the two field windings assist one another instead of oppose. For this reason this is called by the electrical engineer

a cumulative compound instead of differential compound machine.

The regulation of maximum output is effected by the centrifugal governor, which keeps the speed of the machine constant. For that reason this may be placed in the class of mechanically regulated machines.

The purpose of the additional field, SEF, is to increase the output of the generator as the lights are turned on, without increasing the speed of the generator. For example, with all lights out, the generator will deliver about 6 amperes, while with all the lights burning it will develop 12 amperes. In between these two points it will deliver additional amperes in proportion to the candlepower of the lamps burning, that is, with half the total candlepower, 9 instead of 12 amperes will be the output.

An over-running clutch is always applied to the train of gears in the Gray & Davis system in order to prevent the gasoline motor from driving the cranking motor when the former starts up.

A starter switch connects the battery with the motor when cranking. This circuit is separate from the lighting and is direct from the battery to the motor.

A circuit independent from the lighting is used for the starter. Wires connect direct from battery to motor and are of No. 0 size in most installations, although in some No. 000 has been used to insure maximum efficiency. The starting switch, SS, is placed in this line. This switch is interconnected with the cranking gear train so that when the starting gear is shifted into mesh with the flywheel gear the current will be turned on.

The starting switch has two points; the first permits only a small current to flow to the motor, while the second allows the full battery current to rush through the motor. The first condition is obtained by imposing resistance in the line. Its purpose is to permit easy meshing of the gears without throwing on full power before the gears are meshed their full width. This is the usual practice with all types of flywheel geared starter switches.

This is the only machine with mechanical regulation which provides for an additional regulation in proportion to the output of the generator, Figs. 2 and 3.

The two generators which Gray & Davis make both have the distance from the base to the center of the armature the same, namely, 2.68 inches. In over-all length one of the machines is 12.11 inches long, the other 11.34 inches. In over-all width they are both 5.5 inches. The larger one weighs 32 pounds and the smaller one 25 pounds.

For cranking, two electric motors are provided by Gray & Davis. One weighing 38 pounds and capable of cranking motors up to 36 horsepower and the other weighing 66 pounds and suitable for 75-horsepower motors. In both cases these motors are designed for a working speed of 1,500 revolutions per minute using 6-volt current. Both motors are cylindrical, one 8 inches in diameter, the other 6.63 inches.

The gear ratio used between the motor and the crankshaft naturally varies with the size of the motor to be cranked. It varies from fifteen to one in the case of a small motor to twenty to one in the case of a large motor. Assuming a cranking motor speed of 1,500 revolutions per minute the gasoline motor will turn over at the rate of 100 revolutions per minute with the first gear ratio and 75 revolutions per minute with the second ratio.

The current drawn in each case will vary with the size of the motor, the temperature conditions existing at the time of starting, the speed at which the motor is rotated and the condition of the battery. These are fundamental considerations and must be taken into account whenever comparing starters.

The Gray & Davis cranking motor takes current at the rate of 80 to 120 amperes under normal conditions. These are only relative values and not specific.

On account of the comparatively large reduction between the cranking motor and the crankshaft it is particularly convenient to apply the power from the Gray & Davis cranking motor through a train of reduction gears one of which meshes with a gear on the flywheel. The size of the flywheel makes it possible to get a large reduction very conveniently and for that reason is very popular with this type of starter. This system is applied in other ways with equal success, as, for example, through a worm and gear attached to the transmission gearcase.

Ward Leonard—Three-Unit System

Another 6-volt system of lighting and cranking is furnished by the Ward Leonard Electric Company. The system is placed in the three-unit subdivision as a separate motor and generator are used. The ignition system which may be used is optional with the purchaser. Either magneto or magneto ignition can be used.

The output of the generator depends upon the size of the battery to be charged. It is usually fixed at the charging rate recommended by the battery makers for initial charging. Inasmuch as the user drives his car only for short periods at a speed which would cause the generator to give its maximum output, it is claimed that it insures a full charge all the time. As the battery makers claim that overcharging is more desirable than undercharging it is evident this is erring on the safe side.

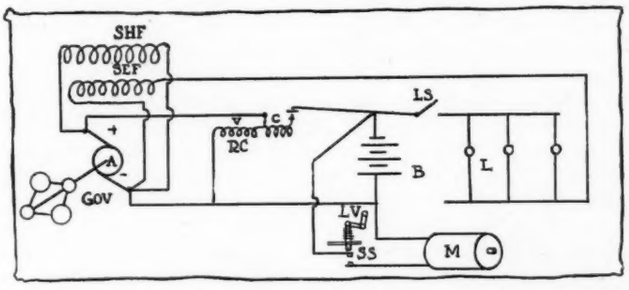

Fig. 1—Wiring diagram of the Gray & Davis system for lighting and cranking

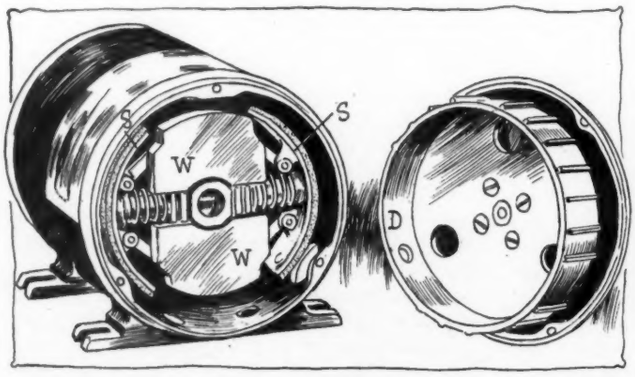

Fig. 2—Gray & Davis governor regulator; S, friction surface; W, weights. Springs hold S against drum D until centrifugal force separates weights W and compress springs

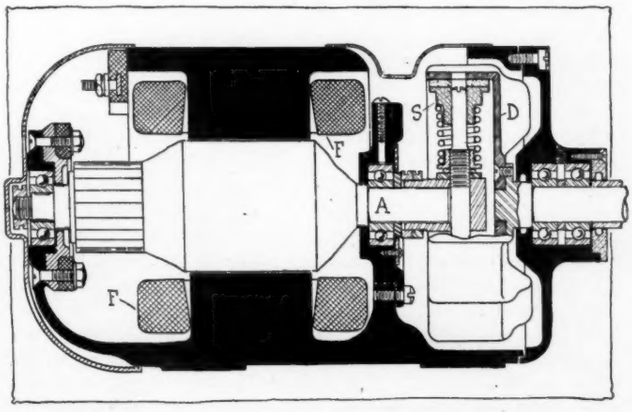

Fig. 3—Sectional view of Gray & Davis dynamo. This view shows the regulator illustrated in Fig. 2, mounted in the right end of generator casing

At the New York Shows—Electric Starters and Cars to Which They Were Applied

Name of Starter	Name of Car	Name of Starter	Name of Car
Gray & Davis...	Columbia	Ward Leonard..	Henderson
	Davis		King
	Firestone-Columbus		Moline
	Flanders		Renault
	Lenox	Westinghouse...	Case
	Lozier		Herreshoff
	National		Matheson
	Norwalk		Marion
	Paige	Adlake	Locomobile
	Pathfinder		Pierce-Arrow
	Peerless		Stevens-Duryea
	Pope-Hartford	Auto-Lite	Abbott-Detroit
	Reo		Jackson
	Selden		Patterson
	Stearns	Electro	American
	Stoddard-Dayton		Auburn
	Velie		Westcott
North East.....	Cunningham	Esterline	Knox
	Firestone-Columbus		Kissel
	Havers		Mitchell
	Imperial	Jesco	CarterCar
	Marmon		Cutting
	Michigan		Keeton
	Pullman	Wagner	Moon
Delco	Cadillac		Speedwell
	Cole		Studebaker
	Hudson	Aplco	Interstate
	Oakland		Marathon
	Packard	Entz	Franklin
U. S. L.....	Edwards-Knight		White
	Garford	Rushmore	Kline
	Overland		Mercer
	Rambler	Dean	Schacht
		Leece-Neville...	Haynes
		Nelson	American

The generator meets the maximum load from 300 to 350 revolutions per minute, depending on the gear ratio of the car upon which it is mounted. Above this speed it charges the battery. The generator may be driven at crankshaft speed or at one and one-half to one. The company also builds a lighting generator which operates at two to one. The weight of the generator is about 30 pounds.

The system consists of three units: a generator, motor and regulator. The regulating devices are contained in a small box which may be mounted either at some convenient place on the chassis or on top of the generator. The latter position greatly simplifies the wiring of the car.

The regulator contains two devices, a reverse current cut-out and the output regulator. The reverse current cut-out, RC, consists of two coils, the potential or voltage coil closing the relay and the current coil holding the relay closed until a reverse current opens it up. The regulator merely consists of a current coil in the main line. This inserts resistance in the field circuit when the output reaches a predetermined point. The controller is in constant vibration whenever the generator comes up to a speed where it delivers or exceeds the maximum output allowed. It will be seen from this that the entire control is accomplished by this regulator and that the generator is a simple shunt-wound machine.

The Ward Leonard cranking motor weighs about 38 pounds for a 45-horsepower motor and the company builds in addition a smaller cranking motor for engines of less than 25 horsepower. The characteristics of these motors differ somewhat from the general run of 6-volt apparatus in that they are designed for high speed. When under load they run at from 2,500 to 3,500 revolutions per minute. As a result the gear ratio necessary varies from thirty to one to forty to one.

The current required for continuous cranking varies from eighty to 100 amperes at 6 volts. This will crank a motor from sixty to 100 revolutions per minute depending upon its size. The most usual method of connecting the motor to the engine with this system is through the flywheel. On account of the large gear ratio necessary with this cranking motor it is almost necessary to include the flywheel in the gear train in order to reduce the size of the gears.

A special switch is also used for cranking. It consists of laminated copper strips about 1.25 inches wide and 5 inches long. They are fastened to a copper block forming one of the terminals of the switch at one end and are brought into contact with another block when it is desired to start the cranking motor. An eccentric is used to force the contacts together. There are two

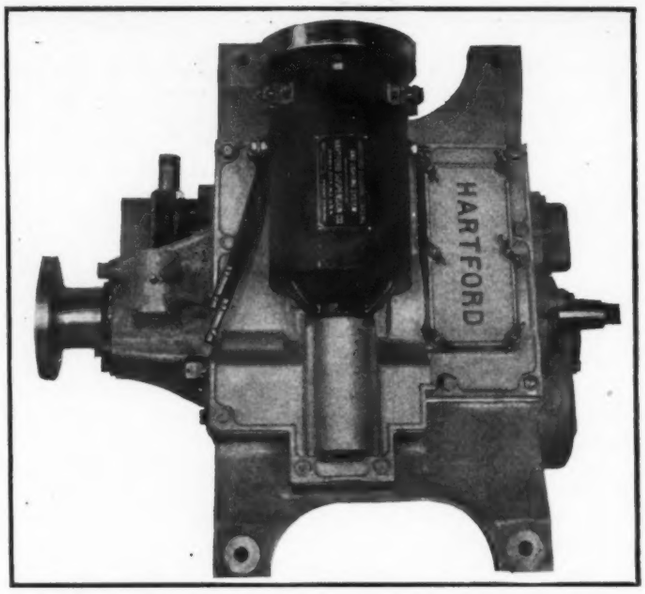

Fig. 4—Mounting the Hartford motor generator on gearset

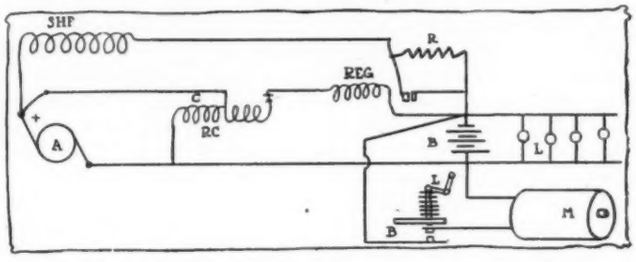

Fig. 5—Ward-Leonard wiring diagram for electric cranking system

points on the switch, one for permitting the motor to turn over slowly to facilitate meshing the gears and, second, the running position.

Hartford—High Speed Motor

The Hartford electric system has three units, the motor, generator and magneto being separate and distinct units. The system is so arranged that the generator is controlled by a governor which operates at a car speed of 14 miles per hour and by a cut-out which operates in the neighborhood of 6 miles an hour. The storage battery floats on the line. The generator is geared constantly to the transmission gears or timing gears at the option of the purchaser.

Taking up the units independently, it may be stated that the generator is of the permanent magnet type with auxiliary electromagnetic fields, the latter being wound around the pole shoe extension. The pole shoes of malleable iron are fitted to a cylindrical housing provided with threaded ends to which are attached the end covers. The covers have knurled edges, making it easy to remove the parts desired. The armature is drum-wound and has the wires insulated by a baked-on substance which renders them impervious to moisture. The commutator segments are separated by insulating material wound directly on the chrome-nickel steel armature shaft. The armature shaft is carried on ball bearings designed to take both radial and thrust loads.

In order to protect the battery from the high voltages which would be created if the generator were driven at excessive speeds a centrifugal governor of the friction type is employed and comes into operation at 14 miles an hour car speed.

The brushes employed to take the current from the commutator of the generator are of the carbo-metallic type. They may be reached by lifting a spring-retained cover mounted on the end casing. The brushes and holder may be removed as a unit. In

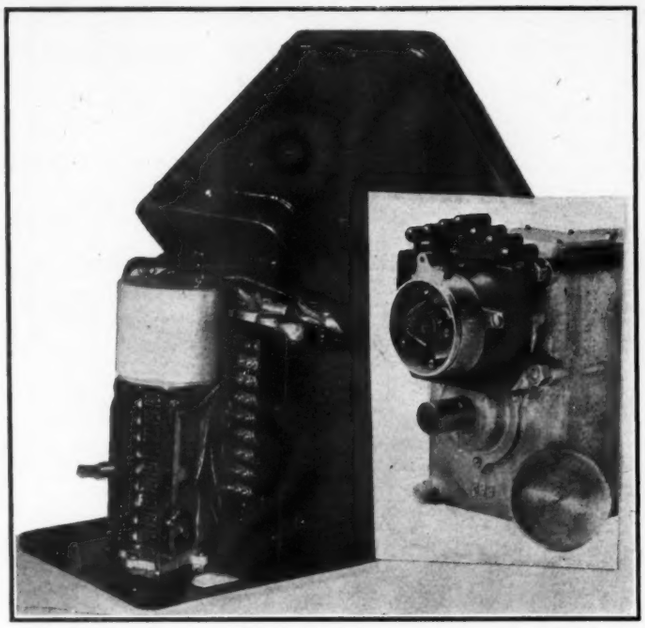

Fig. 6—View of Electro generator, showing interior and mounting of distributor on casing

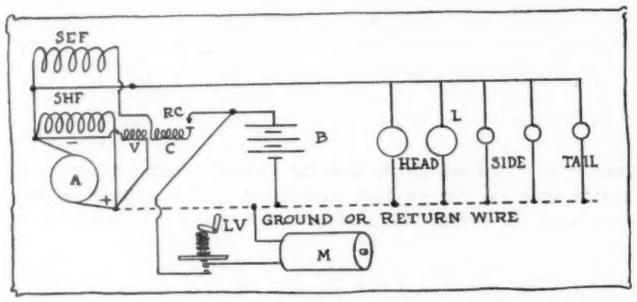

Fig. 7—Wiring diagram of Westinghouse six-volt system, showing grounded return wire

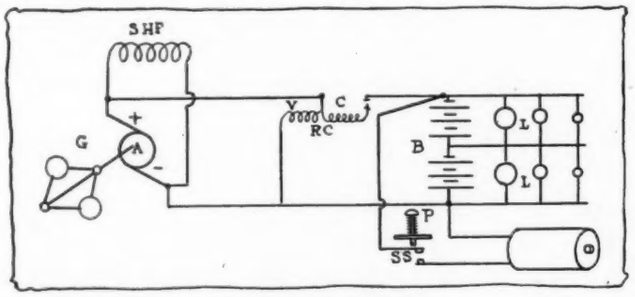

Fig. 8—Wiring diagram of the Hartford system for lighting and cranking

systems where the battery is floated on the line it is necessary that the generator be cut out when the voltage developed falls below that of the battery or else the battery will be discharged through the commutator. In the Hartford system a magnetic reverse current cut-out, R C, is used. The generator is cut in when the automobile is traveling at 8 miles an hour and is not cut out until the speed of the car falls to 6 miles an hour. It is entirely automatic in its action. At a car speed of 8 miles an hour the generator is developing approximately 7 amperes. As the car is speeded up the rise in the amperage is gradual until a speed of 15 miles an hour is obtained, at which point a little over 11 amperes is developed. From this point the curve declines to 8.5 amperes, which is held at 25 miles an hour and over. The voltage curve starts at 13 at a car speed of 7 miles an hour and rises gradually to a maximum of 14 volts. The generator is driven from the crankshaft, on the recommendation of the manufacturers, by silent chain at the ratio of three to one, although gear drive may be employed if desired. The battery is of 12-volt, 60-ampere-hour capacity. The headlights are connected to one-half the battery and the dash side of the tail lamps to the other half, hence all lights operate at 6 volts.

The electric cranking motor is of somewhat unusual type in that it is designed to operate at about 7,000 revolutions a minute. The gear reduction between the motor and the crankshaft of the gasoline engine varying from 100 to 1 to 125 to 1, the reduction being obtained by a combination worm and spur gear having an efficiency of 85 per cent. In other words, the crankshaft is revolved at a rate of from forty to seventy turns a minute, depending on the engine size, compression, stiffness, temperature and other conditions. To further describe the motor, it may be said it is of cylindrical shape, 7.5 inches long and 4.5 inches in diameter. Its weight, including gears, etc., is 35 pounds, and without the gears, 20 pounds. The extension of the armature shaft is provided with a worm which meshes with a large gear giving a reduction of twenty-five to one. A further reduction of five to one is secured by spur gears. The efficiency of the small motor is secured by the use of a small flywheel weighing 4.5 pounds, which, turning over at 7,000 revolutions per minute stores up considerable kinetic energy between the times when the motor is acting against the compression of the gas engine, thus enabling it to carry its load at a very nearly constant speed. The gears between the motor and the engine crankshaft are always in mesh, but since the worm gear is not keyed to the shaft of the motor but is secured by a friction over running disk all danger of harm to the electric motor, should a backfire occur, is eliminated. The starter consumes on an average between 200 and 225 watts. The motor is series-wound, the torque increasing with the load.

U. S. L.—Flywheel Installation

The U. S. L. is a two-unit system. In installing this system the armature of the motor-generator supplants the flywheel and performs its functions as well as those of the electric lighting

Manufacturers of Electric Cranking, Lighting and Igniting Apparatus

Name	Address	Light.	Start.	Ign.
A. B. Mfg. Co.	Poughkeepsie, N. Y.	•		
Adams & Westlake	Chicago, Ill.	•	•	
Aplco (Apple Electric Co.)	Dayton, Ohio	•	•	
Autolite (Elect. Autolite Co.)	Toledo, Ohio	•	•	
Bailey Electric Starter Co.	Grand Rapids, Mich.	•	•	
Bijur Motor Lighting Co.	New York	•	•	
Deaco (Detroit Elec. Appliance Co.)	Detroit, Mich.	•	•	•
Dean Elec. Co., Otho	Elyria, Ohio	•	•	
Elyria		•	•	
Dynalux		•		
Delco (Dayton Elec. Lab. Co.)	Dayton, Ohio	•	•	•
Disco (Ignition Starter Co.)	Detroit, Mich.	•	•	
Economy Mfg. Co.	Economy, Pa.	•		
Electro (Electro Light & Starter Co.)	Indianapolis, Ind.	•	•	•
Entz (Dyneto Electric Co.)	Syracuse, N. Y.	•	•	
Emmerson Electric Co.	St. Louis		•	
Esterline Co.	Lafayette, Ind.	•	•	
Gray & Davis	Boston, Mass.	•	•	
Gould Storage Battery Co.	New York	•		•
Hartford (Hartford Suspension Co.)	Jersey City, N. J.	•	•	
Hartman Electric Mfg. Co.	Mansfield, Ohio	•		
Holtzer-Cabot Elec. Co.	Brookline, Mass.	•		
Jenney Electric Starter Co.	Indianapolis, Ind.	•	•	
Jesco (Jones Electric Starter Co.)	Chicago, Ill.	•	•	
Leece-Neville Co.	Cleveland, Ohio	•	•	
Nelson (Peru Auto Parts Co.)	Peru, Ind.	•	•	
North-East Elec. Co.	Rochester, N. Y.	•	•	
Northwestern Mfg. Co.	Milwaukee, Wis.	•	•	
Remy (Remy Electric Co.)	Anderson, Ind.	•	•	•
Rushmore Dynamo Works	Plainfield, N. J.	•	•	
Spindler & Derringer	Jersey City, N. J.	•		
Splitdorf Electric Co.	Newark, N. J.	•		
Sprague-Waldo Mfg. Co.	Detroit, Mich.	•	•	
Strong Electric Co.	Des Moines, Iowa	•		
U. S. L. (U. S. Light & Heating Co.)	Niagara Falls, N. Y.	•	•	
Vesta Accumulator Co.	Chicago, Ill.	•	•	
Vivax Storage Battery Co.	Chicago, Ill.	•		
Wagner Electric Mfg. Co.	St. Louis, Mo.	•	•	
Ward Leonard Elec. Co.	Bronxville, N. Y.	•	•	
Warner Arc Light Co.	Davenport, Iowa	•		
Wells (R. C. Wells Mfg. Co)	Fond du Lac, Wis.	•		
Westinghouse Elec. & Mfg. Co.	E. Pittsburg, Pa.	•	•	•
Total		41	30	6
Percentage, based on 42 manufacturers		98	71	14

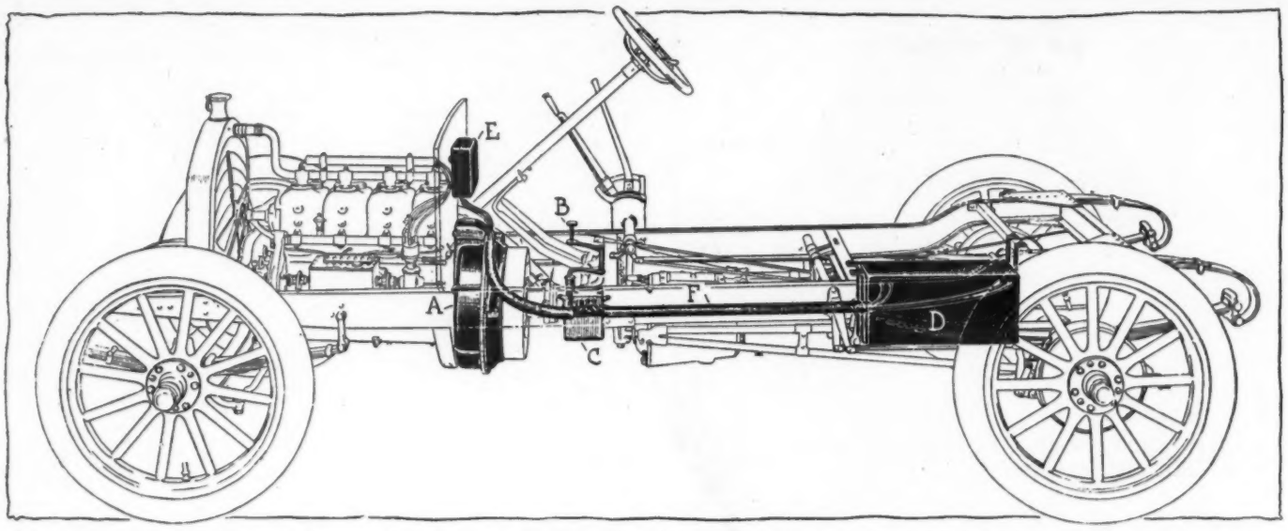

Fig. 9—Mounting of U.S.L. system on Rambler Car; A, motor-generator; B, starting pedal; C, switchbox; D, battery; E, regulator

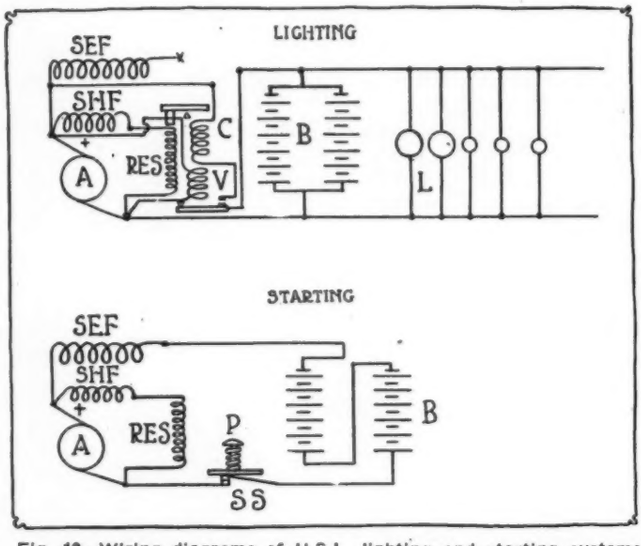

Fig. 10—Wiring diagrams of U.S.L. lighting and starting systems

and cranking systems. There are two independent windings on the field, one for the motor and one for the generator. The voltage of the motor is 24, while the charging voltage of the generator is 12.

The preferred disposition of the units is that shown in Fig. 9. As will be seen, the added weight will be only that of the battery, fields, switches and controller as the flywheel is removed and replaced by the armature of equal weight. When a foot switch is pressed the battery is connected to the motor and this turns over the gasoline engine at the rate of from 200 to 300 revolutions per minute. The speed at which the motor is turned over and the amperage drawn in turning it over are functions of the stiffness of the motor and its size, or, in other words, the amperage drawn by the same voltage rises in proportion to the resistance. The field is in series with the armature and is assisted by the shunt field, Fig. 10. With series motors the field excitation is greater as the motor speed falls and the torque of the motor increases. The amperage drawn by the motor in spinning the engine in the average case will jump to 150 and then will fall back to a running amperage of approximately 75.

As soon as the motor picks up to a speed giving 8 miles an hour, the motor generator becomes a shunt-wound generator and starts to charge the battery, restoring the current used at a 30-ampere rate. In order that the output of the generator shall be uniform a carbon pile regulator operated by a series coil C, is used. This keeps the output through the working range of from 600 to 1,200 revolutions per minute practically constant. At higher speeds than the latter the output drops off and thus a dangerous overcharge to the battery is prevented. In order that it will be impossible for the battery to discharge back through the motor generator at speeds below charging or while the car is standing at rest a reverse current cut-out opens the line between the battery and the motor generator.

On account of the small added weight, the motor generator parts in this system are made larger than if it were necessary to cut them down to the minimum. The commutator, for instance, is 10 inches across and the carbon brush contact is .75 square inch on the average installation. The storage battery used with the system has a capacity of 130 ampere-hours at 12 volts.

Westinghouse—Grounded Return Wires

The Westinghouse combined lighting, cranking and ignition system has two units. First, a cranking motor which may be located in the most convenient position, and, second, a generator which takes care of the lighting circuit and also of the ignition. The entire system is operated at 6 volts and is grounded at one point. This greatly reduces the wiring, and since every part of the system is at the same voltage permits of the use of single contact lamp sockets, etc.

The generator in the Westinghouse system takes care of ignition as well as lighting. It is of low speed, turning over at crankshaft speed on four-cylinder motors and at 1.5 crankshaft speed on sixes. It can be driven from the crankshaft or installed in any convenient place. There are no permanent magnets used in the generator, which is of the compound differential-wound type. The output of the generator is controlled electrically due to the compound winding. A reverse current cut-out is provided and is so adjusted that on the average four-cylinder car the battery circuit is cut in above 10 miles an hour and cut out below 7 miles an hour. This difference prevents the switch from cutting in and out continuously when the car is running at one particular speed. When the generator is connected to the battery by the automatic switch the current rises rapidly with the speed until a value of from 5 to 7 amperes is obtained if the lamps are not burning. Above this the output rises very gradually, the curve being nearly flat for all motor speeds so that the danger of an excessive charging rate in day touring is eliminated. This is accomplished by the reversed compound field winding on the generator.

When the lights are turned on the output of the generator increases proportionately. This is accomplished in the following manner: Assume that the load is 6 amperes, that the generator

output is 3 amperes, then 3 amperes will be taken from the battery. The battery current must go through the series field SEF on its way to the lights, thus assisting instead of bucking the shunt field SHF.

Now assume the condition of 7 amperes output from the generator and a lamp load of 6 amperes. This leaves 1 ampere for charging. That 1 ampere goes to the battery through the series field SEF, and in the reverse direction which causes that field to oppose the shunt field instead of assisting it as in the above case. The figures are merely for explanation.

The preferred installation of the cranking motor is by gear to the flywheel or to the front end of the crankshaft. The reduction from the cranking motor to the engine varies from 10 to 1 up to 22 to 1. The amperage on the jump or when the starting switch is first thrown in is 200. The storage battery capacity is 100 ampere-hours. The starting motor is series wound and is made in three sizes of different torque rating to take care of gasoline motors of different ratings. The switch which operates the starting motor has two points. The first movement causes the electric motor to turn over very slowly to facilitate engagement of the gears, between the motor and the flywheel, and the second point causes the cranking motor to spin the engine.

Aplco—Two-Unit System

The Aplco is a two-unit system. The electric cranking motor and the generator are contained in one unit and the magneto forms the second unit. The make of the magneto is optional and is separate and distinct from the lighting and cranking systems. The system operates at about 6.5 volts as far as the lamps and generator are concerned. The cranking motor, however, operates at 24 volts except in the case of installation on the Interstate motor, where the cranking motor operates at 30 volts. The generator is the low-speed type working at crankshaft speed. The generator may be driven by chain, gears or by any other means compatible with the crankshaft speed at which it is designed to run.

The weight of the motor-generator is 70 pounds. The generator furnishes current for the lighting system, however, and therefore its weight is less than the weight of two units, which it replaces.

The regulation of the current from the generator at high speeds is governed inherently by the compound differential winding on the motor-generator. **Besides this, when the battery has become fully charged there is a device which automatically stops the generator from charging.** The generator will not again start to charge the battery until the current in the battery drops to a definite point. This gives a protection against overcharging. A magnetic reverse current cut-out prevents the battery from discharging through the generator when the car is not in motion.

The motor is geared through a differential planetary set at a reduction of forty to one to the motor. It is fitted with a roller type of overrunning clutch and a centrifugally operated slipping clutch. The starting switch is of the two-point type. A non-grounded system is used and if battery ignition is used it is essential that this have a non-grounded primary also.

Some of the features of the control used in this system are worthy of note. The cranking, lighting and igniting systems can be locked in any position. The lights may be left on or off or any lights desired may be left burning. This control is in the terminal board, where all electric control is located. Another feature is the tell-tale light which glows when the generator is not charging and the engine is running. The battery may be tested also by this lamp. When fully charged the lamp will light up brightly when a button is pressed.

Electro—Single Unit System

The Electro system has a unit starting motor and lighting and ignition generator, the dimensions of the instrument are 16 5-16 inches base length, 5 3-8 inches wide and 8 5-8 inches body height. The weight of the motor-generator is 100 pounds. It is necessary to arrange the motor with a short driving shaft in-

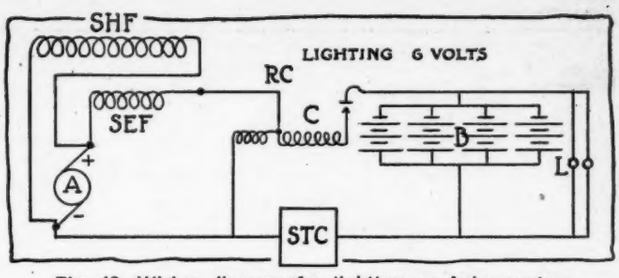

Fig. 12—Wiring diagram for lighting on Aplco system

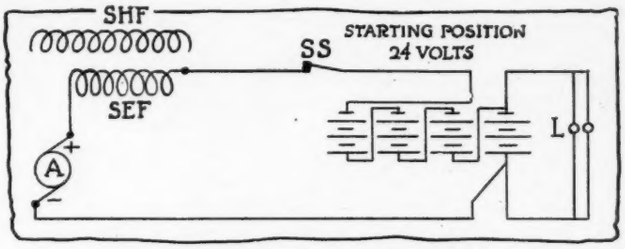

Fig. 13—Wiring diagram for cranking on Aplco system

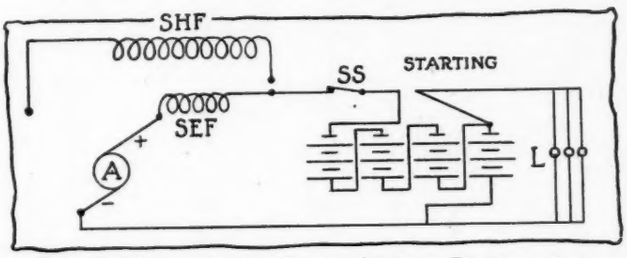

Fig. 14—Wiring diagram for cranking on Electro system

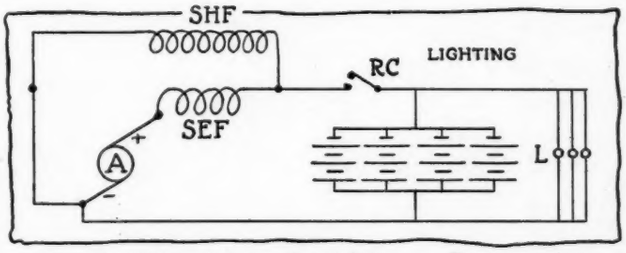

Fig. 15—Wiring diagram for lighting on Electro system

tegral with the motor case, driven either through the timing gears or silent chain and connecting to the starter with an Oldham coupling. The motor-generator is always in operation. When turning below 380 revolutions per minute it is a motor and when turning above that rate it is a dynamo or generator. The compound differential winding takes care of the output from the generator. No reverse cut-out is provided to disconnect the battery from the motor-generator entirely at very low speeds. Instead of this the ignition switch breaks the line between the battery and generator when the motor is stopped by cutting off the ignition.

The system operates on 24 volts, but charges the battery at 6 volts. The amperage drawn by the 24-volt motor when turning over the gasoline engine varies with the size of the motor as in all systems. In the case of a 4.125 by 5.25, six-cylinder motor at a speed of approximately 55 revolutions per minute the running current was 90 amperes on a test. The compression on this motor was 70 pounds. It was shown on this same test that it was possible to turn the gasoline motor over for 1 hour and 23 minutes. The gear reduction between the motor-generator and the gasoline engine is twenty-five to one when starting and change automatically to a direct drive when the gasoline engine starts running.

(To be continued)

The Automobile

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H. M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
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Boston—1035 Old South Building Cleveland—309 Park Building

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Vehicles of Labor

THE dual motor truck exhibition in progress in this city this week is one of the best in the history of the motor truck industry in that evidences of conservatism, and building for a purpose, are seen on every hand; and there are general indications which show that the manufacturer is not trying to market trucks on a radical basis, but rather to sanely meet the requirements of individual transportation as they exist today.

The buying public of passenger cars has during the last 10 years become accustomed to seeking for the changes the same as the public looks for the varying fashions from season to season. This is but natural in the passenger car field, but it has not a place in the business transportation field. The buyer purchases a truck as a business proposition, and not as a social issue, consequently he is not interested in whether this year's product is the same as last year's, providing it does the work and gives the satisfaction that he demands.

Because of this condition the majority of the truck models on exhibition are little altered from a year ago, **the biggest changes consisting of bringing out additional models to supplement those of last season, to make the line comprehensive enough to meet all requirements.** This is a commendable move as it makes it possible for a large industrial house requiring trucks bearing from 1,500 pounds to 6 tons to equip throughout with the same make of vehicle, thereby greatly simplifying its service relations with the maker. Industrial concerns have already realized the additional complications necessary when operating half a dozen trucks of different makes in that it calls for so much greater knowledge in repair work, and so much greater complexity in carrying stocks of repair parts, etc.

That manufacturers are realizing more and more the necessity of conserving time is proven by the **numbers of rapid-unloading devices exhibited.** These in general assume one of two forms; first, the demountable body with the wheel stand on which the body can be slid instead of unloading, and second the trailer design in which the load-carrying part is supported on two wheels and at its forward end rests on the tractor. There has been general improvement in the tractor field during the year.

The influence of the National Association of Automobile Manufacturers and also the Society of Automobile Engineers on motor truck design shows itself in nearly every exhibit. The uniform guarantee plate is coming into general use, and should prove a constant reminder to the truck owner or driver that the truck is capable of carrying a limited load and that its speed should not exceed a certain maximum. The influence of these two organizations is also shown in reduced body weights and further in the fact that some manufacturers selling chassis without bodies state the chassis capacity inclusive of body weight, so that whenever a body exceeding a stated weight is put on there is a corresponding number of pounds cut off the useful load that the vehicle can carry. The more headway a movement of this nature can gain and the sooner it can get under way the better for the industry.

The truck buyer is being better provided for by way of tires than ever before. The dual rear is now almost universal in vehicles of over 1-ton capacity, and manufacturers of tires are apparently sufficiently satisfied with the situation to issue 10,000-mile tire guarantees. This has a double meaning: First, the tires have been improved, and, second, they are more adequately fitted for the service they have to perform.

The influence of the N. A. A. M. and S. A. E. and also the body builder is seen in the neater housing of brake connections, etc., beneath the frame level, making it possible to install standard bodies without interfering with any of the operating parts.

There are many other minor improvements: Brakes are larger and more accessible to adjustments; frame sections are generally wider, deeper, and of heavier gauge; not infrequently springs have wider leaves and more of them; axles are heavier in the majority of cases; there are many more governors fitted than heretofore and quite a few of them are inter-connected with the speed of the car rather than being controlled by the speed of the motor crankshaft; there is a gradual turning to left-side steering wheels, a movement which is slow but up to the present fairly certain; and in a résumé of the many other parts of the truck many detailed improvements may be found, such as fitting supplementary springs, larger grease cups, better cab protection for the driver, more robust radiators, and quicker demountability of component parts.

Eastern States Greatest Users of Electric Truck

One-Third of 10,000 Electric Commercials Now Used Produced Last Year

From an address by Arthur Williams, president of Electric Vehicle Association of America, before a Boston meeting of the New England section of the association on January 10.

WITH an encouraging and formidable array of figures witnessing the vitality of this comparatively new industry, it may prove interesting to consider its beginnings, its growth, and the means by which the latter has been brought about. Then, having reviewed events and facts accomplished, we may turn to the future which has already been predicted for electric vehicles, and consider methods by which today's great expectations may become the actualities of tomorrow.

Electric pleasure cars were built as early as 1893, and current-propelled trucks came into existence in 1897. That these forefathers of our present machines possessed disadvantages, we all know. They were clumsy, expensive, and not always dependable. Their storage batteries were heavy and useful only for short distances, besides requiring expert handling. Then, too, central station authorities looked with such indifference upon those horseless carriages that they set the price of current for charging purposes at almost prohibitive figures. But, in spite of all these difficulties, early electric trucks were by no means the utter failures which their opposers pictured them. They were the first commercial cars ever used and today several 1899 models—made by a firm in Hartford, Connecticut,—are still running. The original truck of the Central Brewing Company is still making regular trips through New York's streets, with a total cost of less than $100 a year for repairs.

Setting this fallacy aside, then, reasons for former public unbelief in the advantages of electrics may be summed up as: misrepresentation of the characteristics of such cars; general ignorance of their good points; lack of charging facilities; and—as I have already remarked—such deficiencies in the vehicles themselves, as clumsiness, inadequacy of batteries, and complexity of mechanism. Misrepresentation consisted largely of assertions that the electric was the rival of the gasoline car for any and all uses. The fact that charging stations were few and current very expensive served, also, as a deterring influence. Finally, people in general knew nothing about the special excellencies of current-fed vehicles for city and suburban needs.

Today, nearly all of these conditions have been changed, and this transformation has been wrought, for the most part, within the last 2 years. First of all, the electric motor car itself has been very considerably improved. Its imperfections have been wiped out; it has been made simple of operation, reliable, dependable. The average distance which a pleasure vehicle can now travel upon a single charge has been increased to about 65 miles, while, in certain instances, records of 100 have been made.

Everywhere electric vehicles are rapidly gaining popularity. **In New York, between July 1, 1911, and July 1, 1912, the number of such cars in use grew 45 per cent.,** while an authority on electrical affairs in Chicago estimates that **this method of trucking has increased 400 per cent. during the last 2 years.** At St. Louis, for the first 6 months of 1912, one central station reported a gain of about 37 per cent. in income from charging cars.

The Public Service Corporation of New Jersey has kept a most interesting and careful record concerning the adoption of power-driven vehicles in its territory during the past two years. At the beginning of 1911, only about eighty pleasure cars were discovered, many of these being old models seldom used. The total number of electrics in the territory was about 139, the price of current for charging them being a little more than four cents per kilowatt hour.

Since the Public Service Corporation entered upon its campaign of pushing electric vehicles, **the total number of them in its neighborhood has risen from 139 to 440, and the cost of current has dropped from slightly more than 4 cents per kilowatt hour to an average of a trifle over 3.5 cents.**

The foregoing instances, illustrating conditions in various parts of the country, serve to show that, very generally, the power wagon has made tremendous strides during the last 2 years. Today some 30,000 of them are in operation in the United States, about 20,000 of these being for passengers, and about 10,000 serving commercial purposes. **One-third of this entire number were produced and marketed during the past year.** Oddly enough, perhaps 80 per cent. of all electric trucks and delivery wagons are being used east of the Alleghanies, **while by far the heaviest demand for pleasure vehicles comes from the Middle West.**

Having thus presented to you indications of the recent spurt in the electric vehicle industry, I should like to turn your attention to the question: **What causes have brought about this change?** As president of the Electric Vehicle Association of America, I am happy to say that I believe our society has had a large share in accomplishing these happy results. When the Association was formed, 2 years ago, current-propelled cars suffered from lack of concentrated effort to push them into public notice. Their makers found the cost of production high, owing to comparatively small sales; storage battery concerns had, accordingly, only a limited market for their output; and central station managers, seeing but little demand for current for charging, kept the price of such supply at discouragingly high figures.

Special attention should perhaps be called to an indirect result of the work of our organization. This is the steady decrease in the cost of current, owing to greater interest taken by central stations in electric vehicles and to the greater number of such cars in use. The price of current for charging 10 years ago averaged about 23 cents per kilowatt hour throughout the United States, while today it costs a little less than 7 cents with a reduction to about 4 cents for large consumers. Meanwhile the price of gasoline has risen steadily.

So much for the electric vehicle as it is today. Let us now turn our attention to its future, for the storage battery car has come to stay. Already, authorities are predicting an output of some 15,000 during 1913. They are, undoubtedly, desirable cars for city needs owing to their ease of operation in crowded streets, their low cost of maintenance, as well as their special adaptation for many stops, starts and waits. This is an important point, especially in delivery service.

An estimate has placed the amount of trackless hauling throughout this country at sixteen times as much as that carried on by railways. Of this, 80 per cent. is done in cities. Now, if electric propulsion were to be adopted for this work, it could be performed more quickly, safely and economically than by horse power, and this ought to result in reducing prices of many commodities.

Russian Trade Growing

In 1901 Only Forty Automobiles Were Imported But in 1911 the Total Jumped to 2717 Machines

There Are Only 5,392 Cars Registered in the Whole Country—90 Per Cent. Are in Cities

IN Russia the use of automobiles is growing, though slowly. In 1901 only forty automobiles were imported into Russia, and in 1902 still less, thirty-seven, but by 1906 the imports jumped to 245 automobiles and steadily rose from year to year, until in 1911 they reached the number of 2,717. The distribution of the importing countries may be seen from the following table for the year 1910:

Imported from	Automobiles
Germany	1,247
France	388
Great Britain	86
Austria	69
United States	49
Italy	20

This table tells us a very interesting thing. It is, of course, clear why Germany, with its proximity to the Russian market, should be able to market over 70 per cent. of the total yearly import, but for the United States export there is no reason to be particularly elated, notwithstanding the fact that as far as design and price go, the American product is at least as good as the German.

90 Per Cent. Are in Cities

The Russo-Baltic Car Company, Riga, Russia, has lately made an investigation as to the distribution of power vehicles in that country, and found that nearly 90 per cent. of all the automobiles in the country are registered in the large cities. Out of a total of 5,492 cars there are registered in St. Petersburg 2,654, in Moscow, 1,608, in Odessa, 377, and in Kieff, 190, or 88 per cent. in these four cities alone. A very large majority of these cars belong to private persons, and only 191 cars to the Government, out of this number 119 cars being registered in St. Petersburg. This figure is of considerable interest because, like most of the foreigners, American manufacturers spend a good deal of money and time in endeavoring to obtain government orders for automobiles, while the same amount of attention devoted to the general market would probably bring much better results.

As regards the kinds of automobiles used, there were found to be 306 motor trucks, and 4,040 passenger cars, including 641 taxicabs. The majority of the passenger cars are very low-powered, from 1 to 10 horsepower. In Moscow, 42 per cent., and in St. Petersburg as much as 48 per cent. of the cars are rated below 10 horsepower. The motor trucks are, on the contrary, comparatively high-powered, 48 per cent. being rated at between 21 and 40 horsepower, with an average horsepower capacity of 18.3. The reason for the low power of the passenger cars is partly the state of the roads and partly the Russian system of taxing automobiles. The cars cannot be practically used outside of the cities, at least not regularly, and even in the cities there are plenty of streets on the outskirts where an automobile will not venture during the rainy season. On the other hand, in all the large cities automobile owners have to pay a municipal tax of 1 to 3 roubles (50 cents to $1.50) per horsepower per year. Trucks pay in many places a lower tax than passenger cars.

The Russian army has a special Automobile Department and Automobile Corps, the latter consisting of about 400 men with an adequate number of officers.

As a matter of fact, what the Russian government would like to do is to buy automobiles of Russian make, and it is quite likely that ere long it will be able to do so. As early as 1899 a Russian concern, Leitner & Company, in Riga, started to build automobiles, but had to discontinue the manufacture partly owing to the small purchasing capacity of the market, but mainly because the cost of manufacture proved to be absolutely prohibitive, and it was very hard to find the highly skilled labor required in this class of work. Since then, however, a good deal of progress was done in the same city by the Russo-Baltic Car Company which began automobile manufacture in 1908, and is said to be fully capable now to build good cars. It builds two models: one with a four-cylinder, 24-horsepower engine, and the other with a 12-horsepower engine. Both models are of very rugged construction, and in this respect peculiarly adapted to runs on the bad Russian roads. The plant can build 200 cars now, but expects to have its facilities increased for the season of 1913.

The import duties on automobiles in Russia are 220 roubles ($116) for cars having four seats and more, 140 roubles ($74) for cars having less than four seats, and 75 roubles ($38) for automobile frames.

In general it appears that there is a market for the cheapest class of American cars in Russia; this market is not very large, but by no means negligible. What the manufacturers should go after, however, is not government orders, but the public. A good deal may be done in trucks and automobile supplies, the latter being now mainly imported from Germany.

Plantation Rubber in 1912

Auction sales of plantation rubber at London during the past year, with one series missing, amounted to 16,789 long tons. Estimating the final offering at 800 tons, the year's total would be 17,589 tons. This is considerably under the estimates made last fall when it was freely predicted that the total offerings of the year would amount to 20,000 tons.

In 1911 the total sales at auction were under 10,000 tons.

The course of prices has been generally downward since last January although the highest level was reached at $1.32 1-4 in March and the low average was 96 cents, established in November. Since then the market has been gradually rising in response to the check in offerings as the promised increases of large size failed to materialize.

The average price brought in 1911 was just over 5 shillings and in 1912 it was 4 pence less.

The plantation predictions for 1913 are for 40,000 long tons which would mean an average auction sale of 1,480 tons at each of the twenty-seven periods covered. The average of 1912 was 620 tons and in 1911 about 340.

No Automobiles in Odder

One of the oddest sights in Europe may be witnessed any day in the little city of Odder, Denmark. There are four thousand people dwelling here, but they have never relaxed from their earliest declaration, namely, never to permit the driving of an automobile through the streets. Consequently, a man in a business suit and a soft hat rides astride a black horse, which draws the motor car through the town. The operation affords great fun for the children, who pile into the automobile, even sitting on the laps of the chauffeur and occupants. A heavy fine attaches to any person attempting to violate the ordinance.

The roads of France, on the whole, do not compare in excellence with those of England. But it is an acknowledged fact that the condition of the roads of France has been growing worse during the last 10 years. Some charge it to steel-studded automobile tires, while others hint that the Government is lax in its duty of keeping the roads up to the mark.

Makers Mulcted by French Decision

PARIS, Jan. 10—In the case of the breakage of an important part of an automobile, involving personal injury, the manufacturer is responsible, and not the person from whom the car was

hired, according to a decision just handed down by the Paris Court of Appeals. The decision arose out of a claim made by Mr. Strowbridge, of Philadelphia, for $100,000 damages for injuries received in a car rented from the Société Routiere.

Three years ago Mr. Strowbridge was touring through the Pyrenees in a car hired at the rate of $35 a day, when, on passing through Moret-de-Marsan he was thrown out of the car and seriously injured owing to the jamming of the steering gear. As a consequence of the accident Mr. Strowbridge had to have both legs amputated. The Court of First Instance awarded Mr. Strowbridge $14,000 damages against the hiring company, refusing to admit the plea that the manufacturer was responsible. In the judgment it was stated that it was the chauffeur's duty to constantly supervise the steering gear.

At the Court of Appeals this decision was amended, the judgment being given that the manufacturer was responsible for any constructional defect, and that the chauffeur, not being an engineer, must rely on the proper initial construction of the automobile. Therefore the manufacturer of the automobile, and not the hiring company, was ordered to pay $14,000 to Mr. Strowbridge. This decision is one of considerable importance to automobile manufacturers for they have always claimed that their responsibility was limited to the changing of any provedly defective part. Such a clause is incorporated in practically every sales contract drawn up in Europe. The automobile having been hired in this case, the client had not signed any document releasing the maker from responsibility for personal injury.

Ascertaining Loss of Weights by Heating

Conradson determines the water content of heavy oils by the loss in weight on heating. However, he recognizes the fact that whenever a heavy oil is heated to a temperature of 100 degrees Centigrade some oil is volatilized and lost. Wright heats to 105 degrees Centigrade, Hurst to 220 degrees Fahrenheit, and Archbutt and Deeley to from 105 degrees to 110 degrees Centigrade. Davis saturates a tarred filter paper and heats to 110 degrees Centigrade, Patrick heats the oil until slight decomposition takes place and assumes the loss in weight to be a loss of water. Gavolovski has improved the evaporation method by using duplicate samples in tarred flasks. He leaves one flask open in the usual manner and attaches to the other a sulphuric-acid drying tube, which he states absorbs the water and allows the oil vapors to pass through unabsorbed. The difference in loss of weight on heating he assumes to be a water loss. Lowenstein dilutes with 95 per cent. alcohol and dries repeatedly on a water bath and then at a temperature of 105 degrees Centigrade to constant weight. The evaporation method, varied as described above, is approximate and applicable only to heavy oils and greases. Its accuracy even with heavy greases is questionable.

Iron and Steel Made in Sweden

The production of iron ore in Sweden in 1911 was 6,153,778 metric tons, of which 5,769,528 tons was directly usable ore, 3,060 tons bog ore and 381,190 tons concentrates. The concentrates resulted from the treatment of 813,973 tons of low-grade ore. Pig iron production was 634,392 tons from 112 furnaces, against 603,939 tons in 1910. Foundry and special pig iron amounted to 32,992 tons, Bessemer and basic to 408,591 tons, forge to 181,525 tons and blast furnace castings to 11,284 tons. One electric ore reducing furnace produced 10,065 tons. The output of puddled iron blooms and bars was 146,722 tons, and of steel ingots and castings, 470,867 tons. The total of crucible and electric furnace ingots was 4,195 tons. The total of manufactured iron and steel was 456,353 tons, against 465,062 tons in 1910.—*Iron Age.*

Comparing the goosequill with the steel pen and holder, the steel pen with the fountain pen and the fountain pen with the typewriting machine, it is readily realized that simplicity of construction does not always win out in practice.

Credit Extended to Club

Physician's Automobile Club of Vienna Adopts Course By Which Physician May Receive Car Before Payment

Car Is Maintained By the Credit Company at a Monthly Flat Rate of $110

A COURSE which will of necessity result in a considerable increase of automobiles used by physicians of that city has been adopted by the Physicians' Automobile Club, of Vienna, Austria. This club has undertaken to form an agreement with the General Automobile Credit Company, of the same city, whereby the latter concern acts as vendor for a machine bought by doctors and credits him to the extent of the price of the car, which he pays off in monthly instalments of moderate volume. Besides, the club offers to operate the cars for their owners at a very low monthly rate, fixed at a certain price.

The latter point meets with the ideals of many physicians who have had no experience with chauffeurs, the purchase of supplies, and so forth. While the club does not seek to influence the prospective buyers in any way, it acquaints them with the various makes suitable for their purposes. The automobile type ranging between 12 and 20 horsepower is being recommended to prospectives, the price of which varies in Austria between $2,000 and $2,375. When ordering the car, the physicians pay $600, and after delivery from $70 to $80 a month, including 1.5 per cent. on the money yet unpaid.

Flat Rate for Maintenance

The maintenance of the cars, as detailed below, is taken care of by the credit company at a monthly flat rate of $110, which is paid at the end of the month. The maintenance comprises efficient tire equipment at all times, supply of all necessary fuel and lubricants, regular wages, illness and accident insurance for the chauffeur, fire and liability insurance, garage and washing cost, charging of batteries to keep the electric lighting systems in operative condition at all times.

On the other hand, the physician closing a contract has to agree to the following: The automobile must not be used to travel more than 1,000 kilometers (621 miles) a month, as controlled by a reliable odometer. Every kilometer traveled in excess of the 1,000 mark must be paid for at the rate of 5 cents per. Only 150 kilometers (93.15 miles) out of the 621 miles a month must be made outside of the city limits. A price of 5 cents additional must be paid for every kilometer made outside of Vienna. This rule is founded upon the logical conclusion that the benefit of the low rates offered by the credit company should accrue to the medical profession and to physicians in their specific capacity as such, rather than to private individuals. [NOTE: How is the number of kilometers traveled outside the city limits to be controlled? Unless the doubtful process of relying on the statements of the car owners is adopted, success of this part of the scheme is hardly conceivable. We remember that Vienna has a very great number of exits impossible to control.—ED.]

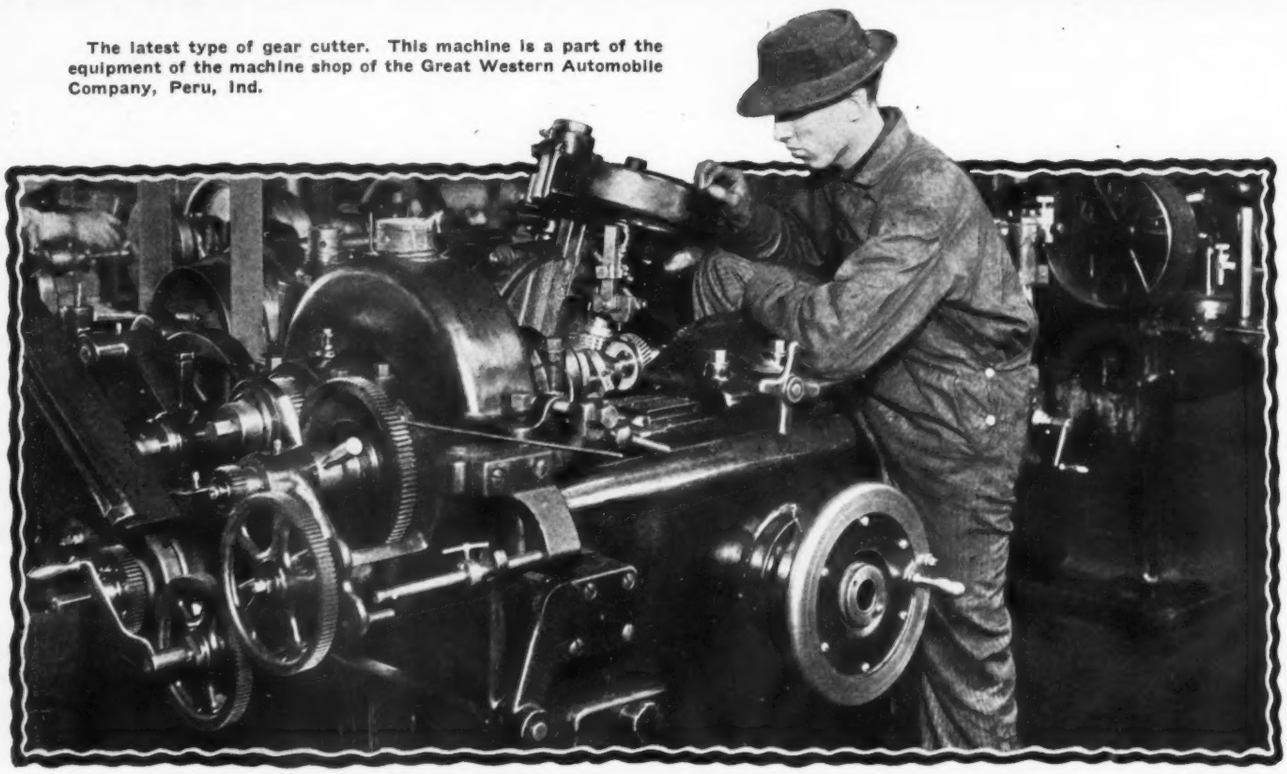
The Austrian regulations do not permit a Viennese doctor to work outside of the city precincts.

Another rule is that all repairs must be made in the shop of the credit company, where a moderate rate is charged for the work. If a car has to be laid up more than 3 days in the shop without the repair work being finished, an indemnity of $1.60 a day is paid to the owner by the credit company. Furthermore, if tire prices fall or rise more than 10 per cent. of the present rates, such an occurrence is to be sufficient ground for a proportionate change of the flat rate of monthly maintenance.

The physicians' club naturally believes that these easy conditions will cause many doctors to become users of automobiles.

Factory Miscellany

The latest type of gear cutter. This machine is a part of the equipment of the machine shop of the Great Western Automobile Company, Peru, Ind.



THIS machine will cut either spiral or spur gears and can turn out twenty finished gears a day, if they are put in the machine singly. If they are put into the machine in pairs, thirty-five may be turned out in one day. It takes but one man to run the machine and to take care of it. This machine will save time, because it turns out from three to five times as many gears as the older type of machine. The machine is automatic in its action and will stop as soon as the gear is finished. Besides the saving in time the machine saves space when considered in proportion to the number of pieces of work turned out. This is extremely important in factory work, where the amount of finished work turned out per square foot of floor space is to the highest degree important in the economical management of the factory.

JEFFERY-DEWITT Adds Plant—The Jeffery-Dewitt Company, Detroit, Mich., manufacturer of spark-plugs, will add a new factory, which will give that company 6,000 additional feet of floor space. The original plant will hereafter be devoted solely to the manufacture of porcelains and the machining of metal parts.

Waukesha in New Building—The Waukesha, Wis., Foundry Company, manufacturing brass and aluminum castings, has started operations in the building formerly owned by the Waukesha Canning Company.

Brown Sells Foundry—The Brown Commercial Company, of Peru, Ind., has sold its unoccupied foundry building there to the Peru Machine & Castings Company, and this concern will make all of the castings for that company.

Future Expansion in Beloit—The future expansion of the Stewart-Warner Speedometer Corporation's manufacturing facilities will take place at Beloit, Wis., rather than at Chicago, Ill., the site of the former Stewart Speedometer Company's works.

Oakland Plant Stops Work—Plant No. 1 of the Oakland Motor Car Company, Flint, Mich., was forced to suspend operations for a short time, due to high water. Pontiac Creek overflowed its banks and flooded the basement to a depth of 3 feet.

Calumet's Fire Loss—The Calumet Automobile Company, Appleton, Wis., sustained a loss of about $1,000 by fire, and eight cars and trucks were damaged by fire of unknown origin. The fire started near a work bench and communicated to the building.

Marathon Employees' Clubhouse—The Marathon Motor Works, Nashville, Tenn., has plans under way for one of the finest club buildings in the South. This club will be expressly for the employees of that company, and will have all the conveniences of the best clubrooms in that city.

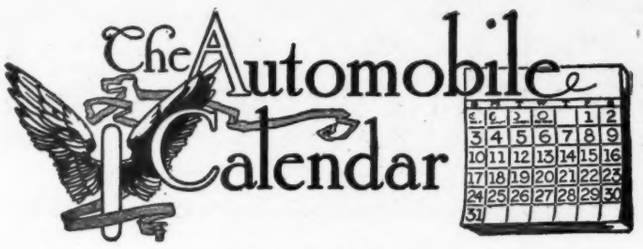
Oliver Occupies Carhartt Plant—The Oliver Motor Truck Company, Detroit, Mich., has moved into the former Carhartt plant on Jefferson avenue and will continue the manufacture of the 1,500-pound, two-cylinder light truck and the 3,000-pound truck, which has been given a four-cylinder motor.

National Gauge to Build—The National Gauge & Register Company, LaCrosse, Wis., which makes gasoline and air gauges, is contemplating the erection of a new plant to cost $50,000. The present works are entirely inadequate to take care of the orders. The company is employing 80 men, and proposes to increase the force to 300.

Pennsylvania Rubber Enlarges—The Pennsylvania Rubber Company, Jeannette, Pa., is planning an immediate extension of its factory. At a recent meeting of the board of directors it was decided to erect a three-story addition to the plant. The new building will cover an area of 8,000 square feet, and will cost approximately $100,000.

Valkenburgh's Plant—C. J. Van Valkenburgh, of Chicago, Ill., is negotiating with the Commercial Club, of Sturgeon Bay, Wis., for the establishment of a works for the production of motor trucks designed by him. The city offers exceptional advantages for commercial propositions, due to its location on Green Bay and Lake Michigan.

Sprinkler System Efficient—The efficiency of the sprinkler system of fire protection for factories was well proven at the Kissel Motor Car Company's works in Hartford, Wis., recently, when an incipient blaze which might have caused great damage was effectually extinguished by the system which is carried throughout the big works.



Shows, Conventions, Etc.

Jan. 11-18.....Milwaukee, Wis., Annual Show, Auditorium, Milwaukee Autmobile Dealers' Association.
Jan. 11-25.....New York City, Thirteenth Annual Show, Madison Square Garden and Grand Central Palace, Automobile Board of Trade.
Jan. 18-25.....Philadelphia, Pa., Annual Automobile Show.
Jan. 21-26.....Toledo, O., Annual Show, Exposition Building, Toledo Automobile Shows Company.
Jan. 25-Feb. 1.....Montreal, Que., Montreal Automobile and Truck Show, R. M. Jaffray, Manager.
Jan. 25-Feb. 1.....Providence, R. I., Annual Show, State Armory, Rhode Island Automobile Dealers' Association, Inc.
Jan. 27-Feb. 1.....Philadelphia, Pa., Truck Show.
Jan. 27-Feb. 1.....Buffalo, N. Y., Annual Automobile Show.
Jan. 27-Feb. 1.....Detroit, Mich., Annual Automobile Show.
Jan. 27-Feb. 1.....Rochester, N. Y. Annual Show, Exposition Park, Dealers' Association.
Jan. 27-Feb. 1.....Scranton, Pa., Annual Automobile Show, Hugh B. Andrews.
Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.
Jan. 27-Feb. 1.....Waterbury, Conn., Annual Show.
Feb. 1-8.....Chicago, Ill., Annual Automobile Show, Coliseum and 7th Regiment Armory.
Feb. 3-8.....Washington, D. C., Annual Show.
Feb. 8-15.....Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.
Feb. 8-15.....Minneapolis, Minn., Annual Automobile Show.
Feb. 10-15.....Chicago, Ill., Truck Show.
Feb. 10-15.....Winnipeg, Man., Show, A. C. Emmett.
Feb. 10-15.....Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.
Feb. 11-15.....Binghamton, N. Y., Annual Show, State Armory. Dealers' Association, R. W. Whipple.
Feb. 15-22.....Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22.....Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23.....Richmond, Va., Annual Show.
Feb. 17-22.....Kansas City, Kan., Annual Automobile Show.
Feb. 18-19.....Madison, Wis., Annual Show, City Market Building. Dealers' Association.
Feb. 18-21.....Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22.....Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22.....Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22.....Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
Feb. 19-23.....New Orleans, La., Annual Show.
Feb. 19-27.....Topeka, Kan., Annual Show.
Feb. 20-22.....Canandaigua, N. Y.. Automobile Show, Louis Blumenstein.
Feb. 22-Mar. 1....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27.....Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 25-28.....Eau Claire, Wis., Annual Show, Armory, Dealers' Association.
Feb. 25-Mar. 1....Syracuse, N. Y., Annual Show, Syracuse A. D. A.
Feb. 26-Mar. 1....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1....Glens Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.
Feb. 27-Mar. 1....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March 3-8.....Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8.....Pittsburgh, Pa., Annual Automobile Show.
March 3-8.....Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Company.
March 3-18.....Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8.....Tiffin, O., Annual Show, Tiffin *Daily Advertiser*.
March 5-8.....Louisville, Ky., Annual Show, Dealers' Association.
Mar. 5-8.....London, Ont., Annual Show, Drill Hall, Louis Blumenstein.
March 8-15.....Boston, Mass., Annual Automobile Show.
Mar. 8-15.....Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Trades' Association.
March 12-15.....Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 19-26.....Boston, Mass., Annual Truck Show.
March 20-24.....New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29.....Indianapolis, Ind., Annual Automobile Show.

Race Meets, Runs, Hill Climbs, Etc.

May 30.....Indianapolis, Ind., 500-Mile Race, Speedway.

Foreign

Jan. 11-22.....Brussels, Belgium, Annual Belgian Automobile Show, Centenary Palace.
March .....France, Sealed Bonnet 3000-Mile Run.
March 31.....Montevidio, Uruguay, International Competition of Agricultural Motor Vehicles.
April.....Barcelona, Spain, International Exhibition.

Wants Free Site—An automobile factory with a $100,000 capital wants a free site in New Martinsburg, W. Va., for a factory.

Auburn Erects Factory—The Auburn Automobile Company, Auburn, Ind., will erect a factory 60 feet by 80 feet, two stories high.

Allen Company Formed—The Allen Motor Car Company has been formed at Fostoria, O., and will manufacture cars ready for delivery in March.

Patterson Factory Progressing—Progress is being made in the construction of the Patterson Rubber Company's building, 250 feet long by 63 feet in width.

Beaver Erects Vancouver Plant—The Beaver Automobile Company, Portland, Ore., recently incorporated with a capital of $150,000, will erect a plant at Vancouver, B. C., to manufacture automobiles.

Quincy Plant Builds—The Machinery & Motor Company, Quincy, Ill., has been incorporated with $25,000 capital stock by Benner Kinsey, Fred H. Wilms and Harry V. C. Tingley, and will equip a plant at once.

Louisville Tire Factory Started—An automobile tire factory is to be started in Louisville, Ky., which will be conducted on a large scale. Mr. H. L. Lewman, of that city, has been elected president of the company.

Pilot Builds Addition—The construction of the addition to the plant of the Pilot Motor Car Company, Richmond, Ind., was connected recently, and ground for the new 120-foot building was broken. The new building will be two stories high.

Dayton Seeking Location—The Dayton Motor Truck Company, Dayton, O., is seeking a location in the South for a manufacturing plant, and it is probable an invitation will be extended the company to come to Gadsden, Ala., and look over the field.

Moreland Plant Grows—The plant of the Moreland Motor Truck Company, Los Angeles, Cal., started in business but 18 months ago with modest dimensions. The factory is now enlarged to spread over 3 acres of floor space. January's output will be 60 trucks. The factory employs 250 men.

Klaxon for Factory Signal—The Critchley Machine Company, Worcester, Mass., has installed in its factory a Klaxon warning signal, which serves as the factory whistle. Similar uses of that signal have been found as adjuncts to the fire alarm systems of a number of other manufacturing institutions.

Bigger White Factory—Plans have been submitted to the White Company, of Cleveland, O., for the construction of a new factory building. They call for a one-story steel and brick structure, 160 feet by 240 feet. The new building is to be erected at the corner of St. Clair avenue and East Seventy-ninth street.

Bethlehem's Two New Buildings—Bethlehem, Pa., is to have two new industries that will give employment to many hands. The Packard Motor Car Company, Detroit, Mich., has decided to establish a storage house, paint shop and warehouse on the site of the old fair grounds, and with a capital of $100,000 the Bernston Steel Wheel Company has been organized, to locate there.

Michigan Factory Addition—New factory buildings now nearing completion at the plant of the Michigan Motor Car Company, Kalamazoo, Mich., will add a million square feet of floor space to the factories. When completed the Michigan plant will be among the six largest automobile factories in America. The new buildings are of three-story reinforced concrete construction, and will greatly increase the output of the cars.

New plant No. 2 of the Jeffery-DeWitt Company, Detroit, Mich.

BULLETIN News of the Week Condensed

Annual banquet of the Society of Automobile Engineers at the new Hotel McAlpin, New York City, January 17

SOUTH-AMERICAN Trade $100,000,000—Remarkable growth in the United States exports to South America from $38,500,000 in 1902 to approximately $138,000,000 in 1912 is shown in a statement issued recently by the Bureau of Statistics. The percentage of gain in the exports to that continent, the statement shows, is much greater than in the exports to any other grand division of the world. In Europe the exports in 1912 were $986,000,000, and 1912 approximately $1,490,000,000; to North America in 1902, $204,000,000, and in 1912, about $578,000,000; to Asia and Oceanica in 1902, $96,000,000, and in 1912 about $212,000,000.

Jenkins with MacManus—W. Haddon Jenkins has resigned as advertising manager of Motor Print to become merchandising expert for the MacManus Company, Detroit, Mich.

Schaefer Resigns—W. E. Schaefer, president of the Schaefer Manufacturing Company, Berlin, Wis., has retired as manager of that company to remove to his old home at Ripon, Wis.

Lee Heads Meet in Frisco—The heads of the different departments of the Don Lee Organization in California will meet for a general conference in San Francisco, Cal., on January 13, 14 and 15.

Thompson Resigns—J. Royden Thompson, a member of the William Thompson & Company, St. John, N. B., has resigned to accept the position of managing director for the Maritime Motor Car Corporation, whose factory is now nearing completion.

Drum Keeton Production Manager—Charles Drum, connected with the production department of the Packard Motor Car Company, Detroit, Mich., resigned recently to accept the position of production manager for the Keeton Motor Company of that city.

Eau Claire's Show—The first annual automobile show for Eau Claire, Wis., will be held from February 25 to 28 in the armory. It will be under the auspices of the Eau Claire Automobile Dealers' Association and thirty-five makes of cars will be represented.

Tiffin's Show on March 5—The third annual automobile show to be given under the auspices of the Tiffin Daily Advertiser, of Tiffin, Ohio, will be held March 5 to 8, inclusive. Sufficient floor space has been procured to show many lines of pleasure cars and trucks.

Frisco's Commercial Show—The San Francisco automobile dealers during the last few years have been opposed to yearly exhibits of pleasure cars, but it is now announced by the Motor Car Dealers' Association of that city that they will hold a commercial vehicle show early in April. Mr. C. A. Blanchard is manager.

Car's Novel Use—W. T. Campbell, who owns a 1,000-acre ranch near Lexington, Ore., besides using his Michigan car for business and pleasure, has rigged up an equipment whereby he pumps water to four large tanks. He simply blocks the car, jacks up the back wheels and connects a belt to the pump with one of them.

Awards in Klaxon Competition—The $250 recently offered by the makers of the Klaxon, the Lovell-McConnell Manufacturing Company, Newark, N. J., for the twelve best letters explaining why the bulb horn should be discontinued as the customary signal in the equipment of the modern automobile, has been awarded as follows: First prize of $100 to F. A. Sears, Rome, N. Y.; second prize of $50 to Dr. A. C. Smith, Elberton, Ga.; and ten prizes of $10 each to ten other contestants.

Automobile Growth in Kentucky—The growth of the use of the automobile in Kentucky is reflected in the semi-annual report of Secretary of State C. F. Crecelius made January 1, 1913, to the State Auditor, H. M. Bosworth. The automobile clerk has collected in the year ending December 31, 1912, within $8,065.20 as much for licenses as was collected during the preceding 18 months, from June 13, 1910, when the law went into effect, until December 31, 1911. The total collected for automobile licenses in 1913 was $37,260.30. For the first year under the law, from June 13, 1910, to June 14, 1911, collections amounted to $23,340.50, and for the 18 months until December 31, 1911, they were $65,325.50.

Automobiles in Buenos Aires—A correspondent in Buenos Aires states that the latest obtainable statistics show that 4,150 automobiles are in use in that city. Of these 3,200 are private cars, 700 are taxis, 200 are used as delivery vans and fifty belong to the public authorities. As regards the countries of origin of these cars, it is computed that 50 per cent. are French, 20 per cent. Italian, 10 per cent. English and a similar percentage German, while Belgium and the United States divide the remaining 10 per cent. In the matter of horsepower, 40 per cent. are over 30 horsepower, 30 per cent. are from 20 to 30 horsepower, 20 per cent. from 10 to 20 horsepower and 10 per cent. unclassified.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Beaver Dam, Wis.	Enger	E. H. Peshak
Boston, Mass.	Bergdoll	Clifton Edwards
Broken Bow, Neb.	CarterCar	Custer County CarterCar Co.
Buffalo, N. Y.	Moon	Miller & Sohulman M. C. Co.
Carroll, Ia.	CarterCar	Carroll CarterCar Co.
Columbus, O.	Moon	Murnan Taxicab Co.
Des Moines, Ia.	Moon	Van Vliet-Bradt M. C. Co.
Hartford, Conn.	Chalmers	Skinner Bros.
Hartford, Conn.	Lozier	H. D. Graves
Hartford, Conn.	Paige-Detroit	Edward S. Clark
Holyrod, Kans.	Moon	G. L. Baker
Houston, Tex.	Moon	Northrup & Clark Co.
Kenosha, Wis.	Rambler	Milton Kent
Marion, Ind.	Havers	Marion Garage & Auto Co.
Milwaukee, Wis.	CarterCar	CarterCar Wis. Co.
Milwaukee, Wis.	Davis Flyer	First Ave. Garage
Milwaukee, Wis.	Pathfinder	Geo. Grede & Bro. Co.
Mitchell, S. D.	Moon	Central Auto. Co.
New Orleans, La.	Chase	B. C. McClellan
New Orleans, La.	Moon	A. N. Kinch
Norfolk, Neb.	CarterCar	Kennedy & Caldwell
Osborn, Kans.	CarterCar	Osborn County CarterCar Co.
Philadelphia, Pa.	Garford	Eldredge Co.
Queenstown, Ont.	Franklin	H. St. Clair Fisher
Rochester, N. Y.	Havers	F. R. Luescher, Inc.
Syracuse, N. Y.	Havers	C. Arthur Benjamin, Inc.
Toledo, O.	Moon	Moon Sales Co.
Toronto, Can.	Nyberg	Nyberg Auto Sales Co., Ltd.
Washington, D. C.	Hupmobile	C. H. Kloppmeyer
Washington, D. C.	Hupmobile	Washington Auto Service Co.
Washington, Pa.	Moon	Washington Auto. Co.
Waukesha, Wis.	Apperson	Frank Thompson
Winnipeg, Man.	Havers	Winnipeg Garage Co.
Yankton, S. D.	Moon	F. J. Nyberg

ELECTRIC VEHICLES

Place	Car	Agent
Boston, Mass.	Woods	Whitten-Gilmore Company
Milwaukee, Wis.	Waverley	Esbenshade & Teague
Toronto, Can.	Rauch & Lang	Death & Watson
Washington	Rauch & Lang	Bartram Garage Co.

COMMERCIAL VEHICLES

Place	Car	Agent
Boston, Mass.	Brown	F. F. Wentworth
Bridgeport, Conn.	Brown	Fairfield Auto Co.
Derby, Conn.	Brown	Lombardi Motor Car Co.
Indianapolis, Ind.	Brown	Archey-Atkins Co.
Los Angeles, Cal.	Brown	Renton Motor Car Co.
Milwaukee, Wis.	Little Giant	Little Giant Sales Co.
Newark, N. J.	Brown	Jersey Motor Car Co.
Providence, R. I.	Brown	U. S. Mill Sup. Co.
St. Louis, Mo.	Brown	Meyer-Busch Auto Co.

Smith Transferred—A. H. Smith, formerly manager of the Cleveland, O., branch of the Ford Motor Company, has been transferred to Indianapolis, Ind., as manager of the company's branch in that city.

A Penitentiary Offense—The United States Senate recently passed an amendment to the District of Columbia code making it a penitentiary offense to remove an automobile without the consent of the owner.

Bonde Company Building—The Bonde Motor Car Company, of Fargo, Minn., is to build a two-story and basement automobile house, including storage, showrooms and repair plant. The building will be 25 by 125 feet.

Oakland Agents to Move.—John H. Earle & Co., Washington, D. C., Oakland agents, have leased 817 Seventeenth street, N. W., and after extensive improvements will remove from the present quarters at 1018 Connecticut avenue.

Laurance Closes Contract—L. E. Laurance, Stites, Idaho, has closed a contract with the Mill City Manufacturing Company, Minneapolis, Minn., to make the electric lighted and heated steering wheel which he has patented. The effect is produced by electric globes manipulated by push buttons.

Milford's Club—The owners of the greater number of the automobiles at Milford, Mass., met recently and decided to form an organization to be known as the Milford Automobile Club. A committee was appointed to draw up a set of by-laws and nominate officers.

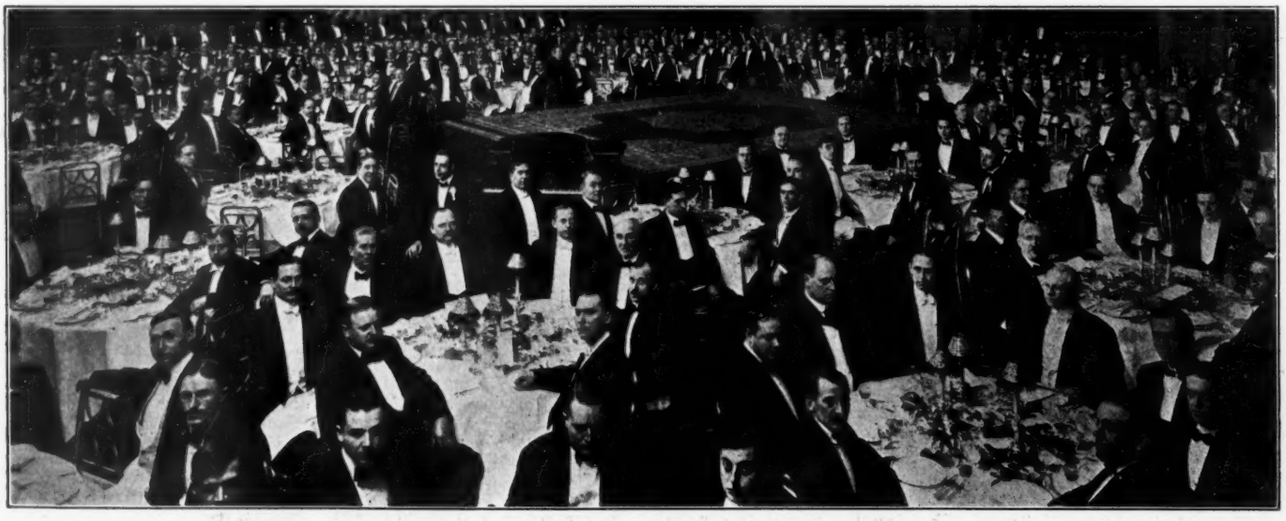
Camp Resigns—H. B. Camp, director of sales promotion for William C. Robinson & Son Company, of Baltimore, Md., refiners of Autoline, has resigned his position to accept the managership of a Western banking and security house making a specialty of underwriting and financing automobile manufacturers.

Lee Tire Declares Dividends—At the meeting held at Conshohocken, Pa., on January 15, the directors of the J. Elwood Lee Company declared a semi-annual dividend of 4 per cent., and the directors of the Lee Tire & Rubber Company declared a semi-annual dividend of 3 1-2 per cent. on the preferred stock of that company.

Waterbury's Show Plans—Preparations are nearly completed for the second annual Waterbury, Conn., automobile show, which is to be held the week of January 27. Thursday is to be society day. More attention will be given the accessories and motorcycles this year. Several of the Hartford dealers are booked for space.

Mansfield Tire Elections—At the annual meeting of the stockholders of the Mansfield Tire & Rubber Company at Mansfield, O., the following officers were elected: Judge C. T. Grant, of Akron, president; G. W. Henne, vice-president and general manager; Jesse E. LaDow, secretary; W. F. Henne, treasurer. These, with Dimon Herring, William Isaly, Charles Hoffman and John Schauer, of Troy, will comprise the board for the ensuing year.

New Models in Summer—A pertinent suggestion which if carried out may change conditions in general in the automobile sales, was made by J. I. Handley, president of the Marion Motor Car Company, Indianapolis, Ind., at a banquet tendered him in Dallas, Tex., recently. He suggested that the manufacturers of automobiles change the dates of changing models from the summer to the winter months. This, he believes, will stimulate trade during the winter months.



Fifth annual banquet of the motor and accessory manufacturers, held at the Waldorf-Astoria, Wednesday, January 15

Standard Moves—The Standard Motor Car Company, Philadelphia, Pa., has removed to 662 North Broad street.

Dallas Has Two Trucks—Since the inauguration of the parcel post service two automobile trucks have been put to work in Dallas, Tex.

Tire Filling Company Moves—The Automobile Tire Filling Company, Philadelphia, Pa., has secured new quarters at 1422 Fairmount avenue.

Cincinnati Has Fire—The Fisher and Kruse Automobile companies, Cincinnati, O., suffered from fire recently. About $10,000 in damages was done.

Rambler Home Enlarged—The Philadelphia, Pa., home of the Rambler has been enlarged by the acquisition of the building adjoining it on the south.

Lester Transferred.—Tom E. Lester, for the past year manager of the Buick Company's house in San Antonio, Tex., has been transferred to Dallas.

Nichols Sales Manager—J. A. Nichols, Jr., has been appointed sales manager for the northwest territory for the Franklin Automobile Company, Syracuse, N. Y.

Overland's $8,000 Loss—Nine automobiles and six freight cars were included in the $8,000 loss incurred when fire destroyed a big loading dock at the Willys-Overland factory recently, in Toledo, O.

Wharton Manager—J. O. Wharton, formerly with the Studebaker Corporation, South Bend, Ind., has accepted the managership of the John Deere Plow Company retail automobile house in Dallas, Tex.

Schmidt Kelly Manager—The Kelly-Springfield Motor Truck Company, Springfield, O., announces the appointment of Henry Schmidt as manager of its new Seattle, Wash., branch, located at 511 East Pike street.

Planning Dallas Tour—Plans are already under way for the Farmers' and Ranchmen's tour to be conducted next summer by the *Farm and Ranch*, of Dallas, Tex. The tour will probably take place next July or August.

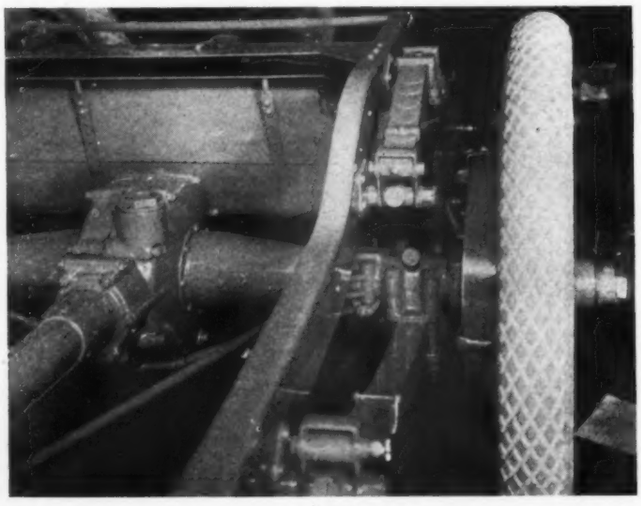
Erickson Superintendent—F. E. Erickson, who has been in the employ of the Universal Truck Company, Detroit, Mich., for a number of years, has become superintendent of the plant to succeed E. W. Dobson, who recently resigned.

Halff Company Moves—The Halff Automobile Company, Dallas, Tex., has moved into new headquarters on automobile row. President Halff has offices on the second floor and will transact the business in Texas from his Dallas headquarters.

Physicians Elect—The following officers were elected at the annual meeting of the Physicians' Motor Club, held in the Hotel Walton, Philadelphia: President, Dr. J. J. Robrecht; secretary, Dr. H. A. Sutton; treasurer, Dr. L. A. Adler.

Omaha's $750,000 Show—Three-quarters of a million dollars' worth of automobiles will be exhibited in the Omaha, Neb., automobile show at the Auditorium, February 24 to March 1. This announcement was made by Manager C. G. Powell, of the show. At the show last year $500,000 worth of cars were shown.

Rural Residents in Majority—According to figures compiled by Theodore B. Roach, president of the Copeland-Roach Motor Car Company, Watertown, Wis., 80 per cent. of the 236 cars sold by his company in the company's territory, comprising parts of three counties in south central Wisconsin, were purchased by rural residents.



Seven-eighths elliptic underslung spring on the Mitchell six chassis

Toledo Firms Combine—An event of considerable importance in Toledo, O., automobile circles took place recently when the United Motor Company and the Landman-Griffith Motor Sales Company merged under the company name of Landman-Griffith-McIntyre Company. Mr. McIntyre will assume the general management of the concern.

Hutcheson Buys Land—J. A. Hutcheson, president of the General Motor Car Company, of St. Louis, Mo., has purchased a plot of ground at 3116 Locust street in the heart of automobile row, and will improve it with three modern automobile stores. The buildings will be of reinforced concrete and fireproof, each with a frontage of 31 feet by a depth of 105 feet.

Michigan's Road Statistics—According to figures furnished by State Highway Commissioner Ely, Michigan has built 463 miles of roads in the last 6 months. The state has paid rewards on all but 100 miles, but all of the road has been accepted by the state. The amount of road built in the last 6 months is larger than the amount build during the first 4 years of existence of the state highway department.

Automobile Incorporations

AUTOMOBILES AND PARTS

ALBANY, N. Y.—Kupke Auto Renting Company; capital, $1,000; to rent automobiles. Incorporators: E. C. Kupke, R. E. Male, W. C. McCune.

BRIDGEPORT, CONN.—Jones Pneumatic Tire Spring Company; capital, $100,000; to manufacture automobile parts.

BUFFALO, N. Y.—Buffalo Automobile Sales Corporation; capital, $15,000; to manufacture and sell engines, machines, etc. Incorporators: W. J. Harris, W. U. Heverly, Maud MacDonald.

BOSTON, MASS.—The Norwalk Motor Car Company; capital, $75,000; Boston automobiles, etc. Incorporators: C. C. Smoth, J. W. Briggs, M. A. Beaudet.

BROOKLYN, N. Y.—Jack Rabbitt Auto Company; capital, $500; to deal in automobiles. Incorporators: Frank Dunn, Donato Cella, Phillip Roth.

BROOKLYN, N. Y.—Pratt-Hendricks Company; capital, $1,000; to deal in automobiles. Incorporators: W. H. Pratt, W. J. Hendricks, G. L. Robinson.

BUFFALO, N. Y.—F. A. M. Auto Supply Company; capital, $20,000; to deal in automobiles. Incorporators: F. A. Marburg, J. B. Green, R. H. Templeton.

CHATTANOOGA, TENN.—Chaplin-Dille Motor Car Company; capital, $25,000; to manufacture and deal in automobiles and trucks, aeroplanes and other kinds of conveyances. Incorporators: B. M. Chaplin, M. C. Wildman and Jas. E. Dille.

CHICAGO, ILL.—American Motor League; capital, $2,500; to deal in automobiles and accessories. Incorporators: J. C. Garriott, Jr., G. T. Carver, M. L. Felkey.

CINCINNATI, O.—The Hermes Motor Car Company; capital, $30,000. Incorporator: Albert Kleybolte.

CINCINNATI, O.—Automobile Clearing House Company; capital, $2,500; to deal in new and second hand automobiles. Incorporators: T. A. Reilly, E. P. Bernardi, S. F. Bromley, A. M. Hirsch, J. B. Bromley.

CLEVELAND, O.—Alco Motor Company; capital, $10,000; to deal in automobiles. Incorporators: M. Kluger, C. K. Halie, Frank Butler.

COLUMBUS, O.—Park Motors Company; capital, $30,000; to deal in automobiles. Incorporators: Scott Van Etteff, Charles Parkison, Amelia Van Etten.

DETROIT, MICH.—Fuller & Son Company; capital, $100,000; to produce automobile parts.

ELYRIA, O.—The J. & H. Taxicab Company; capital, $2,500. Incorporators: A. L. Jackson, M. F. Harrison, Catherine Jackson, M. B. Harrison, L. B. Fauver.

INDIANAPOLIS, IND.—The Wizard Motor Company; capital, $50,000; to manufacture motors adaptable to cycle cars. Incorporators: Orlando C. Forbes, Edward H. Habig and Park S. Florea.

LOGANSPORT, IND.—Logan Auto Supply Company; capital, $25,000; to deal in automobiles. Incorporators: C. D. Billman, C. D. Pettigrew, O. A. Cummins.

LOUISVILLE, KY.—The Standard Auto Company; capital, $25,000; to buy and sell machines. Incorporators: Geo. A. Dunham, Clifford L. Alderson and J. H. Alderson.

MADISON, WIS.—Madison Gasoline Engine Company; capital, $15,000; to manufacture engines. Incorporators: W. C. Boutly, J. W. Proctor, A. C. Ledford, H. L. Wittiver.

NEWARK, N. J.—Universal Motor Truck Company of New Jersey; capital, $50,000; to deal in motor trucks, etc. Incorporators: John Kramer, Grace Cleveland and Pasquale Mauan.

NEW HAVEN, CONN.—Motor Truck Sales Company; capital, $10,000; to deal in motor trucks. Incorporators: J. F. Denison, H. F. Mabry, Howard Beach.

NEW YORK CITY.—Gildale Motor Corporation; capital, $30,000; to deal in automobiles. Incorporators: F. W. Strauch, T. P. Gilman, E. S. Peck.

NEW YORK CITY.—Duplex Gasoline Motor Company; capital, $200,000; to manufacture engines. Incorporators: G. W. Woodruff, A. P. Nevin, T. U. Parker.

NEW YORK CITY.—Bell & Waring Steam Vehicle Company; capital, $25,000; to deal in automobiles.

NEW YORK CITY.—S. J. Wise & Company, Incorporated; capital, $20,000; to manufacture automobiles. Incorporators: S. J. Wise, C. E. Van Vleck, Jr., E. M. Dalley, C. M. Kohn.

NEW YORK CITY.—Delivery Supervision Company; capital, $1,000,000; to manufacture and sell automobiles. Incorporators: Kenneth Groesbeck, Eben Luther, Hillman B. Hunnewell.

Borowitz Resigns—Joseph Borowitz has severed connection with the Durant-Dort Carriage Company, Flint, Mich.

By Way of Correction—In the January 9 issue of THE AUTOMOBILE, page 95, the Pilot roadster listed at $500 should have been $2,000.

Swords Hawkeye Manager—L. W. Swords has accepted the position of general manager with the Hawkeye Motor Car Company, Burlington, Ia.

Jacobson Opens Warehouse—I. M. Jacobson & Sons, metal merchants in Detroit, Mich., have opened a metal warehouse and works, located at 70 Catherine street.

Brouster White Manager—H. G. Brouster has become manager of the White Motor Car Company, the St. Louis, Mo., agents for the White line of gasoline cars.

Garrison Kelly Manager—The Kelly-Springfield Motor Truck Company, Springfield, O., announces the appointment of L. B. Garrison as manager of its Chicago, Ill., branch.

Shotguns Instead of Police—In the absence of any speed regulation in Montgomery, Ala., the citizens have adopted a shotgun policy to discourage speeding where pedestrians are endangered.

Gettysburg Roads Oiled—The Pennsylvania highway department is making preparations for the oiling of all the roads leading to Gettysburg in time for the unusual travel next summer.

Miller and Mills Take Miller—H. C. Mills and H. C. Miller, who were for years in the Diamond Rubber Company's sales organization, have taken the sales of Miller tires in New York territory.

Road Improvements in Caracas—Street improvements in Caracas, Venezuela, and the improvement of many of the country roads radiating from the capital, have opened a promising field for automobiles.

Stonewall Club Destroyed—The Stonewall Automobile Club building, country headquarters of the Winnipeg, Ont., Automobile Club, was totally destroyed by fire recently. The loss is estimated at $12,000.

Waterloo's New Club—Waterloo, N. Y., has a new automobile club, of which the first officers are: President, G. F. Bodine; vice-president, W. B. Lawrence; treasurer, F. G. Stewart, and secretary, S. C. Post.

Critchley Opens Engineering Department—J. Sidney Critchley, Carlton House, Lower Regent street, London, S. W., has opened a department for the introduction of engineering specialties into Great Britain.

Superior Club Elects—The Superior, Wis., Automobile Club elected new officers at its meeting recently: President, C. A. Erhart; vice-president, Dr. C. H. Mason; secretary, H. R. Corey, and treasurer, Dr. A. J. O'Brien.

Hartford Club Annual—Mayor L. R. Cheney was elected president of the Automobile Club of Hartford, Conn., at the annual meeting held recently. H. D. Maxim was chosen vice-president; Arthur Fifoot, secretary, and Albert M. Kohn, treasurer.

Louisville Show Date Changed—It has been decided to hold the sixth annual exhibition of the Louisville, Ky., Automobile Dealers' Association one week earlier than was announced at first. The dates have been changed from March 12 to March 5.

Shank's Crusade Against Speeders—Lew Shank, mayor of Indianapolis, Ind., has begun a personal crusade against violators of the speed laws. The mayor has twenty arrests to his credit in 2 nights, and he says the squad of motorcycle police will be reorganized.

Milwaukee Fisk Moves—The Fisk Rubber Company, of Chicopee Falls, Mass., has moved its Milwaukee, Wis., branch from 456 Milwaukee street to new and larger quarters at 450-452 Milwaukee street, several doors south. The change gives the company increased repair and stock facilities.

Kelly Moves—The New York City branch of the Kelly-Springfield Motor Truck Company, Springfield, O., has been moved to 239 West Fifty-sixth street. The major portion of this building will be devoted to company showrooms and service station. This branch will be in charge of A. S. Holly.

Good Roads in Texas—Financial provision has been made for the construction of an extensive system of good roads in El Paso County of Texas and a number of counties in New Mexico. The bond issue for good roads in El Paso County amounts to $390,000. In the adjoining county of Dona Ana, New Mexico, $100,000 have been issued for the purpose.

Automobile Incorporations

NEW YORK CITY.—Webster-MacGowan; capital, $50,000; to deal in engines. Incorporators: G. P. MacGowan, W. H. Webster, F. N. Dyer.

NEW YORK CITY.—Gas Saver Sales Company; capital, $25,000; to deal in automobiles. Incorporators: H. C. Fisher, J. H. Miller, Eugene Cable.

NEW YORK CITY.—Pneumatic Hub Wheel Company; capital, $10,00; to manufacture pneumatic rubber cushion hub wheels. Incorporators: Kasiel Blau, George Dorfman, Walter Primoff.

NEW YORK CITY.—Packard Lyric Renting Company; capital, $1,000; to rent automobiles. Incorporators: John Collins, Mary Collins, W. P. Schmuck.

NEW YORK CITY.—Co-Operative Sud Car Company; capital, $3,000; to deal in automobiles. Incorporators: J. B. Bauer, Louis Ezechiel, John Curtis.

NEW YORK CITY.—F. M. Randall Manufacturing Corporation; capital, $5,000; to manufacture motors. Incorporators: F. M. Randall, L. B. Rosenberg, J. C. Weschler.

NIAGARA FALLS, N. Y.—Power City Auto Company; capital, $5,000; to deal in automobiles. Incorporators: Eugene A. Kinsey, James M. Donohue, Augustus G. Porter.

PINEVILLE, KY.—The Cumberland Motor Company; capital, $50,000; to manufacture spring motors.

QUEENSBORO, N. Y.—Elite Auto Wagon Company; capital, $5,000; to manufacture motor trucks. Incorporators: S. A. Hartogensis, Leo Loek, R. S. Hartogensis.

QUINCY, O.—Machinery & Motor Company; capital, $35,000; to repair automobiles. Incorporators: W. Gottleib, C. L. Cohns, H. Waldman.

RACINE, WIS.—The Perfex Radiator Company; capital, $15,000; to manufacture automobile and international combustible engine radiators.

ROCHESTER, N. Y.—The Ball Washburne Motor Company; capital, $25,000. Incorporators: Ward H. Ball, Charles H. Washburne and Asa R. Ball.

SHELBYVILLE, IND.—Hoosier Novelty Company; capital, $10,000; to deal in automobiles. Incorporators: R. E. Baker, R. J. Patterson, J. F. Tierney.

SOUTH BEND, IND.—South Bend Auto Body Company; to manufacture automobile bodies. Incorporators: Samuel Nicholson, Stanley Nicholson, V. E. Paxson, J. C. Paxson.

TOLEDO, O.—Gauntlett Auto Sales Company; capital, $50,000; to deal in automobiles.

TOLEDO, O.—Toledo Electric Company; capital, $25,000; to manufacture automobiles. Incorporators: G. A. Lay, J. B. Lay, J. Baerachi, E. X. Schaeffhold.

UTICA, N. Y.—F. P. Miller Motors Corporation; capital, $5,000; to deal in automobiles. Incorporators: H. R. Beebe, W. T. Cantwell, F. P. Miller.

WILMINGTON, DEL.—Pullman Taxicab Company; capital, $100,000; to manufacture and sell and deal in and with automobiles of all kinds.

GARAGES AND ACCESSORIES

CHICAGO, ILL.—Broc Electric Vehicle Company; capital, $12,000; to carry on a general garage and automobile business. Incorporators: S. N. Gotterman, Thomas C. Lyons, S. M. Corbett.

CLEVELAND, O.—The Forest City Garage Company; capital, $5,000. Incorporators: Christian Hertz, Edward T. Hertz and Emil C. Hertz.

INDIANA HARBOR, IND.—Harbor Garage and Machine Company; capital, $7,500; to carry on a general garage business. Incorporators: Gustave and August Jernberg, Charles F. Saluski.

JAMESTOWN, N. Y.—Peterman Garage Company; capital, $5,000; to do a general garage business. Incorporators: August Peterman, Otto G. Peterman, M. S. Peterman.

LINCOLN, NEB.—Omaha Automobile Club; capital, $10,000; to carry on an automobile club. Incorporators: S. A. Searle, Gould Dietz, B. V. Jewell, C. S. Gould, W. B. Cheek, P. A. Wells.

NEW YORK CITY.—Miller Tire Sales Company; capital, $5,000; to deal in automobile tires. Incorporators: H. C. Miller, Harrison C. Mills, W. A. Schenck.

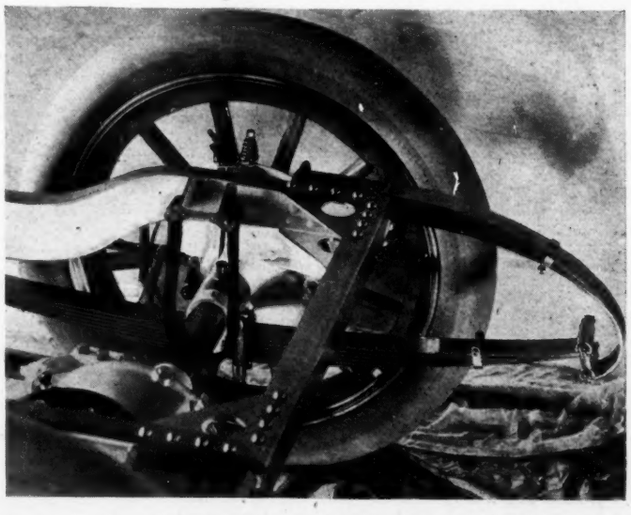
TOLEDO, O.—Shriver Rubber Company; capital, $50,000; to operate a manufacturing and wholesale business. Incorporators: C. A. Shriver, L. H. Shriver, A. G. Florian, E. A. Florian, C. G. Goeltzenleuchter.

CHANGES OF NAME AND CAPITAL

CHICAGO, ILL.—Garfield Automobile Company; change of name to J. C. & S. Company.

DETROIT, MICH.—Northern Auto and Machine Company; change of name to the Northern Auto Company.

SYRACUSE, N. Y.—H. H. Franklin Manufacturing Company; increase of capital from $300,000 to $1,500,000.



Three-quarters elliptic rear spring on the 1913 Stevens-Duryea C-6

Patents Gone to Issue

AUTOMOBILE Heater—In which the waste heat carried by the exhaust gases is utilized for warming the interior of the car.

The subject matter of this patent, an automobile heater, is shown in Fig. 1. It consists of a valve casing which has a port communicating with the atmosphere and which is connected with the exhaust pipe of the motor of the automobile. This valve is operated by a pedal controlled by the driver. A heater adapted for the passage of exhaust gas through it is connected to the casing by a pipe; another pipe connects the heater with the muffler and another pipe the casing of the muffler. A rotatable piston inside the casing forms the valve mentioned above and is adapted to open or close the atmospheric port of the casing and control a passageway to either the muffler or the heater while the atmospheric port is closed.

No. 1,050,230—to Lundy L. Peters, Tiro, O. Granted January 14, 1913; filed November 15, 1911.

Motor Car Top—Consisting of four vertical and six inclined supports to which the fabric is attached.

This patent describes a top construction illustrated in Fig. 1. In this top the fabric or material is held by ten supports, four of which are vertical when the top is in use and are directly attached to the body of the car, the two rear supports being attached permanently and hinged to the body, while the two front supports have hook ends which engage a bolt on the car. The rear vertical supports carry four auxiliary members or supports which form angles of approximately 60 degrees with the vertical support and lie in a plane with them, the connection between vertical and inclined members being such as to permit folding of the members over each other when the top is put down. The front vertical support has one auxiliary member extending forwardly and supporting a bow to which the front end of the top material is attached. The front unit is equipped with so-called keepers which serve for attaching it to the rear unit when the top is not in use.

No. 1,050,167—to Rudolf H. Pfaff, Ashtabula, O. Granted January 14, 1913; filed November 15, 1911.

Automobile Wheel Rim—Which is formed of a number of accurate sections having notches engaged by tongues of the adjoining sections.

This patent describes the tire rim illustrated in Fig. 3, which is used in combination with a wheel, its felloe and a tire supporter on the same, the rim connecting the supporter and the felloe. This rim consists of a main and an auxiliary section, a flange extending from the main section to the auxiliary and between the wheel felloe and the tire supporter. The rim is formed of a number of arc-shaped sections, the end of each section having its flange formed with an inwardly extending notch and the adjacent section with a tongue engaging that notch. Means are provided for holding the main and auxiliary sections of the rim together and to hold the tongue in engagement with the notch.

No. 1,050,624—to George A. Distelhorst, Leshara, Neb. Granted January 14, 1913; filed November 13, 1911.

Multiple-Tube Tire—In which the number of inflatable tubes fill the interior of the casing and are so conducted as to remain in definite relative positions.

In this tire a number of inflatable tubes are contained inside the circular casing which is fitted with beaded edges. The inflatable members are so formed that they bear on each other with their contact planes forming right angles to each other. To prevent relative displacement of these inflatable members corresponding points of the abutting faces of the members are connected by ball and socket joints.

No. 1,050,581—to Benjamin Walter, Livermore, Pa. Granted January 14, 1913; filed April 17, 1912.

Auxiliary Air Inlet—Consisting of a ball valve ordinarily closed by gravity and opening when the engine suction rises to a certain degree.

This patent refers to an auxiliary air admission valve admitting air at high speeds when the air entering the engine through the carbureter is not sufficient to give efficient combustion. This device consists of a valve casing secured to the intake pipe of the motor and communicating with a valve chamber which has an air inlet at its bottom. This inlet is normally closed by a ball valve resting on it, but which is lifted when the engine suction is materially increased. The connection between the valve casing and the intake pipe consists of an air-inlet nipple which extends from the casing into the intake pipe and is formed with staggered perforations.

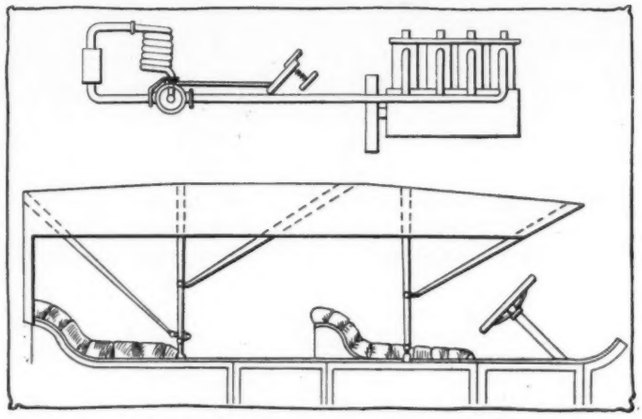


Fig. 1—Peters heater. Fig. 2—Pfaff automobile top

No. 1,050,200—to James Madison Aubrey, Los Angeles, Cal. Granted January 14, 1913; filed October 28, 1911.

Automobile Ignition Magneto—Which includes a housing terminating in bearings for the armature shaft of the magneto.

This patent deals with the construction of a magneto frame, comprising a single casting, consisting of a base plate, a pair of end plates with axially aligned openings and a top plate connecting the end plates. A commutator housing is formed on one of the end plates, which housing has a top opening and a pair of openings for the brushes, in its side walls. The commutator housing terminates in a rectangular bearing portion designed to support the shaft of the magneto armature.

No. 1,050,503—to Bert Whelchel, Indianapolis, Ind., assignor to A. C. Ayres, Indianapolis, Ind. Granted January 14, 1913; filed May 12, 1911.

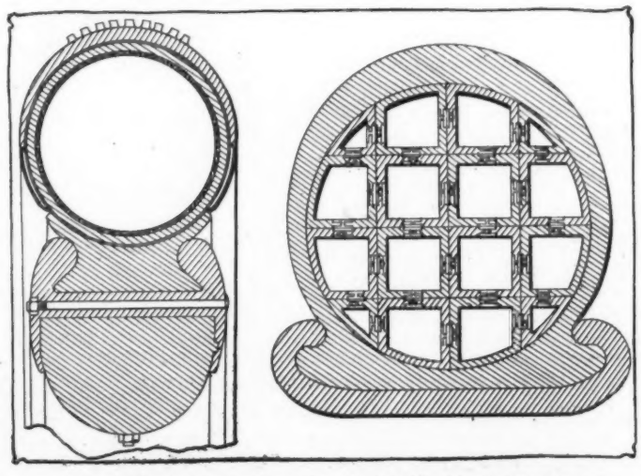


Fig. 3—Distelhorst rim. Fig. 4—Walter Multi-tube tire